
# AUTO-RETURN QUARTZ SYNTHESIZER TURNTABLE

## MODEL AP-Q70/C

ALSO APPLICABLE TO BLACK PANEL MODEL

SECTION 1

# SERVICE MANUAL

## TABLE OF CONTENTS



**For basic adjustments, measuring methods, and operating principles, refer to GENERAL TECHNICAL MANUAL.**

# I. TECHNICAL DATA

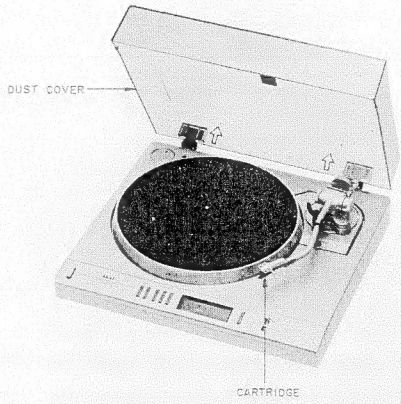
| | |
|---|---|
| TURNTABLE | Aluminum alloy diecast |
| DRIVE SYSTEM AND MECHANISM | Quartz Synthesizer Direct Drive Auto-return |
| MOTOR | DC Servo Motor |
| SPEED CONTROL | 33-1/3, 45 rpm |
| PITCH CONTROL | ±3% Quartz synthesizer controlled |
| WOW & FLUTTER | 0.035% (DIN), 0.025% (JIS) |
| RUMBLE | 46 dB (DIN A), 74 dB (DIN B), 54 dB (JIS) |
| SPEED DEVIATION | ±0.002% |
| TONE ARM | Dynamic balanced type |
| EFFECTIVE ARM LENGTH | 220 mm |
| STYLUS PRESSURE ADJUSTMENT RANGE | 0 to 2.5 grams |
| APPLICABLE CARTRIDGE WEIGHT | 6 to 14 grams (incl. shell weight) |
| ARM LIFTER | Oil damped |
| OVERHANG | 15 mm |
| OFFSET ANGLE | 22°30′ |
| HORIZONTAL TRACKING ERROR ANGLE | +3°5′, −1°13′ |
| CARTRIDGE | MM Type (Ortofon LMB-12)<br>(Model AP-Q70 does not include cartridge) |
| OUTPUT VOLTAGE | 4.3 mV (DIN 45541) |
| CHANNEL SEPARATION | More than 28 dB (DIN 45541) |
| OPTIMAL STYLUS PRESSURE | 1.5 grams |
| STATIC VERTICAL COMPLIANCE | $30 \times 10^{-6}$ cm/dyn |
| STATIC HORIZONTAL COMPLIANCE | $31 \times 10^{-6}$ cm/dyn |
| ANTI-SKATING ADJUSTER | Magnet type |
| POWER REQUIREMENTS | 120V, 60 Hz for Canada dn USA<br>220V, 50 Hz for Europe except UK<br>240V, 50 Hz for UK and Australia<br>110-120/220-240V, 50/60 Hz for the other countries |
| POWER CONSUMPTION | 10 W |
| DIMENSIONS | 440(W) x 140(H) x 400(D) mm (17.3 x 5.5 x 15.8 inches) |
| WEIGHT | 9.8 kg (21.6 lbs) |

*** For improvement purposes, specifications and design are subject to change without notice.**

# II. DISMANTLING OF UNIT

In case of trouble, etc. necessitating dismantling, please dismantle in the order shown in the photographs. Reassemble in reverse order.

1




2


3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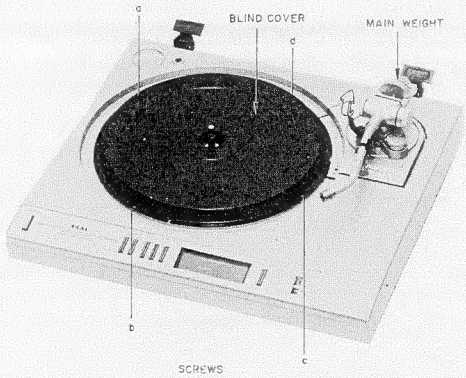


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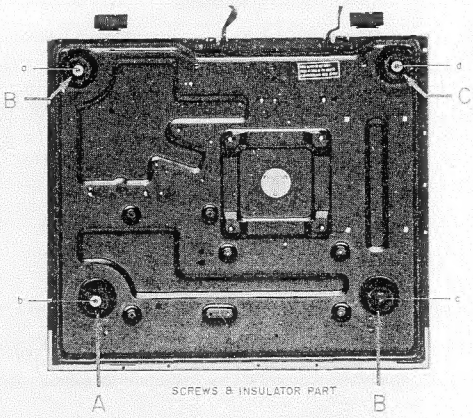


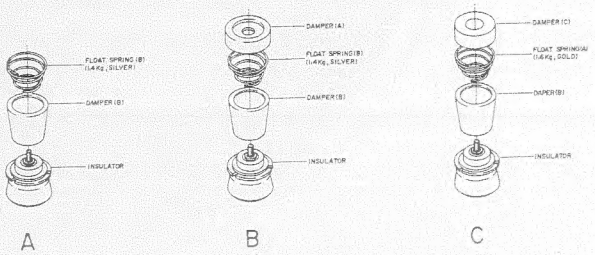


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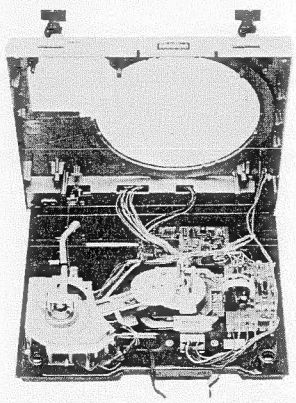


**NOTE:** To level and the turntable, the strength and arrangement of the insulator blocks differ. Install the insulator blocks as shown in the figure.

# I. CONTROLS

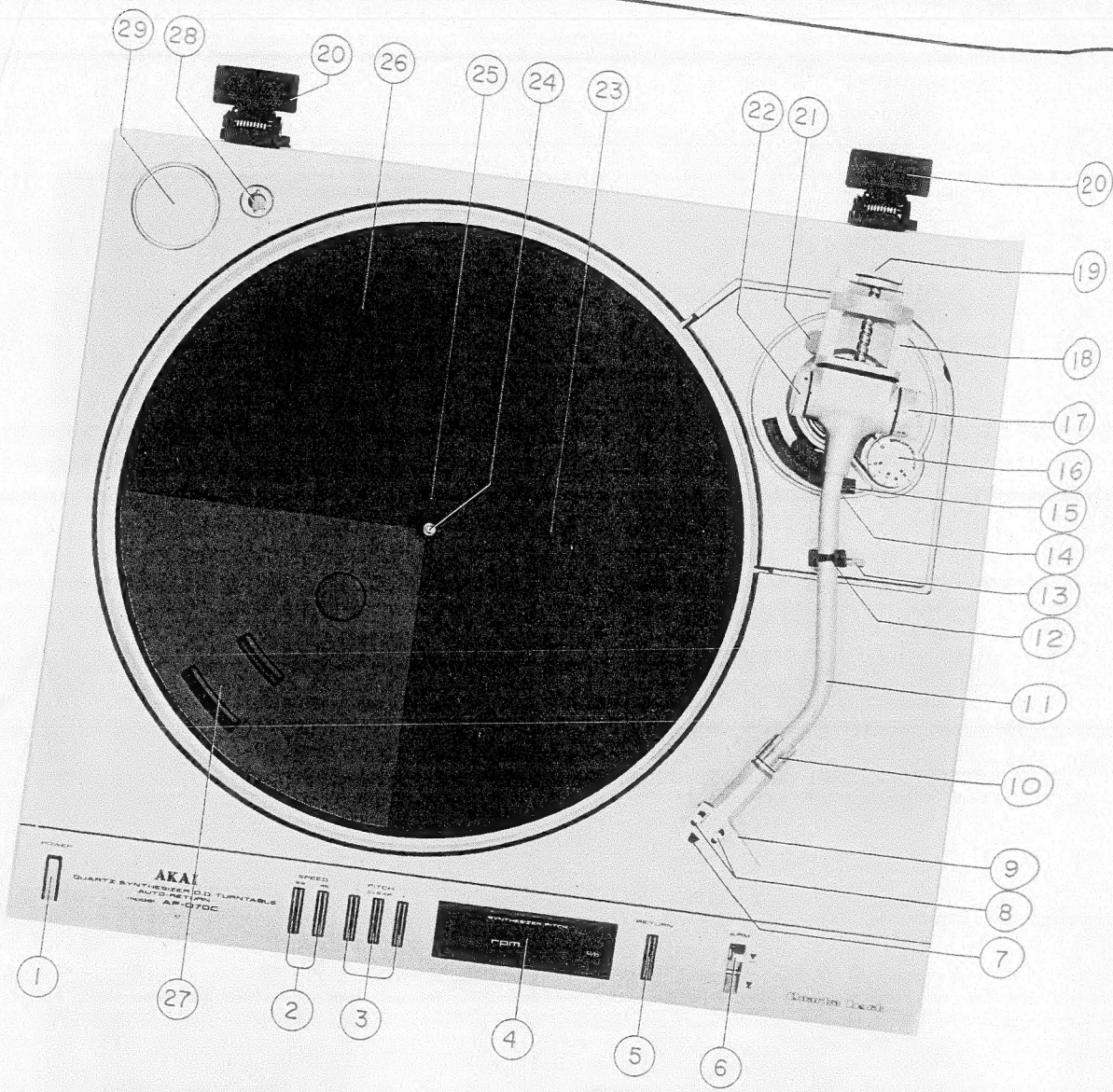



Fig. 1 Controls

1. POWER SWITCH
2. SPEED SELECTOR KEYS (33–45 rpm)
3. PITCH CONTROL KEYS
4. DIGITAL SPEED/PITCH DISPLAY
5. RETURN KEY
6. ARM LIFTER LEVER
7. CARTRIDGE SHELL
8. CARTRIDGE RE-SETTING SCREWS
9. CARTRIDGE SHELL FINGER LEVER
10. LOCKING NUT
11. TONE ARM
12. TONE ARM REST AND LOCK
13. TONE ARM REST HEIGHT ADJUSTMENT SCREW
14. TONE ARM LIFTER ELEVATION ADJUSTMENT SCREW
15. TONE ARM LIFTER
16. ANTISKATING ADJUSTER
17. STYLUS PRESSURE ADJUSTER
18. MAIN WEIGHT ASSEMBLY
19. MAIN WEIGHT ADJUSTMENT KNOB
20. HINGES (for DUST COVER)
21. AUTO-RETURN ADJUSTMENT SCREW CAP
22. MAIN WEIGHT ASSEMBLY LOCK KNOB
23. AUTO-RETURN ADJUSTMENT GROOVE
24. SPINDLE
25. OVERHANG ADJUSTMENT GROOVE
26. RUBBER MAT
27. TURNTABLE PLATTER
28. CARTRIDGE SHELL HOLDER
29. 45 rpm ADAPTER HOLDER

# IV. PRINCIPAL PARTS LOCATION

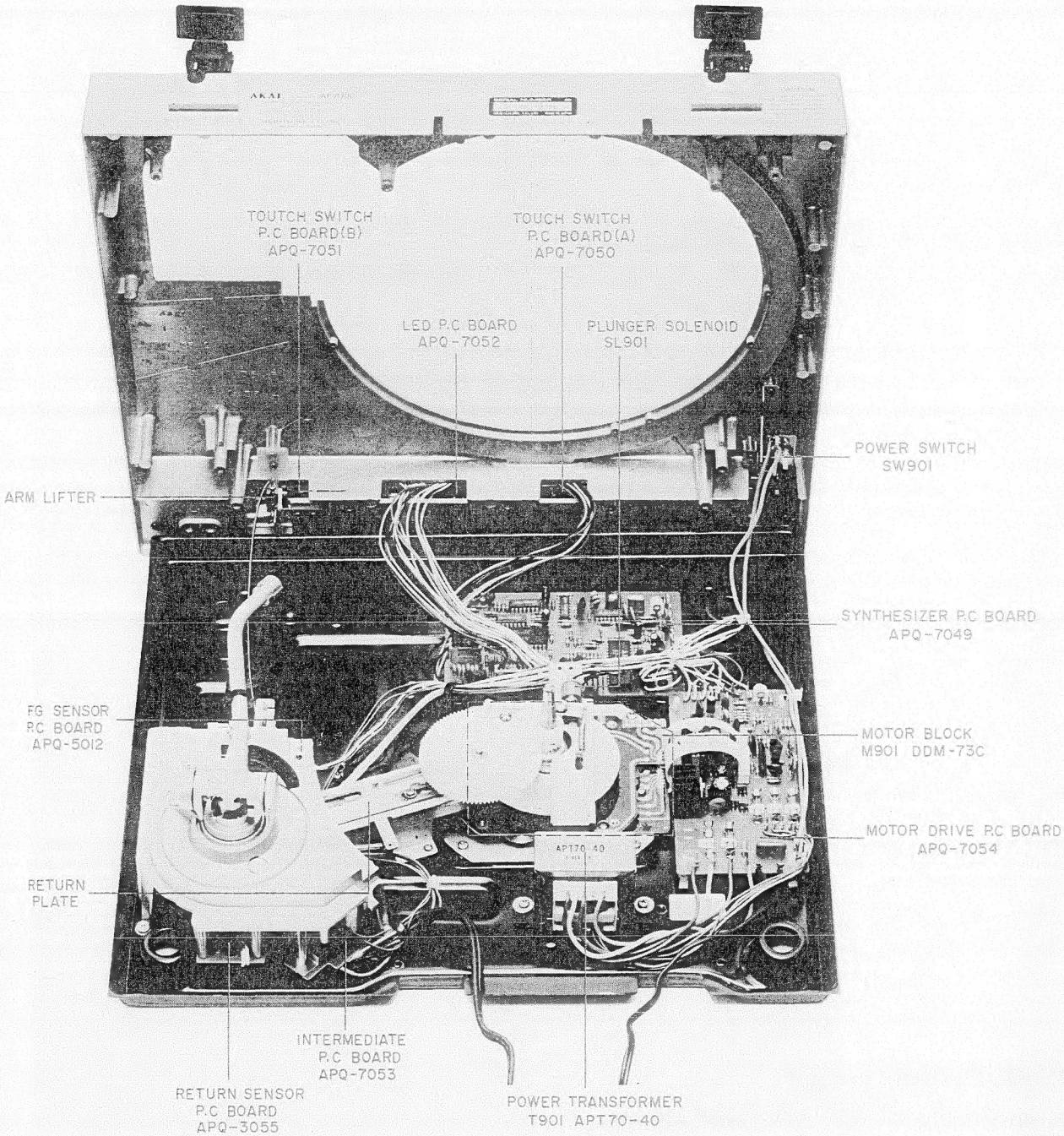



Fig. 2

# IV. PRINCIPAL PARTS LOCATION

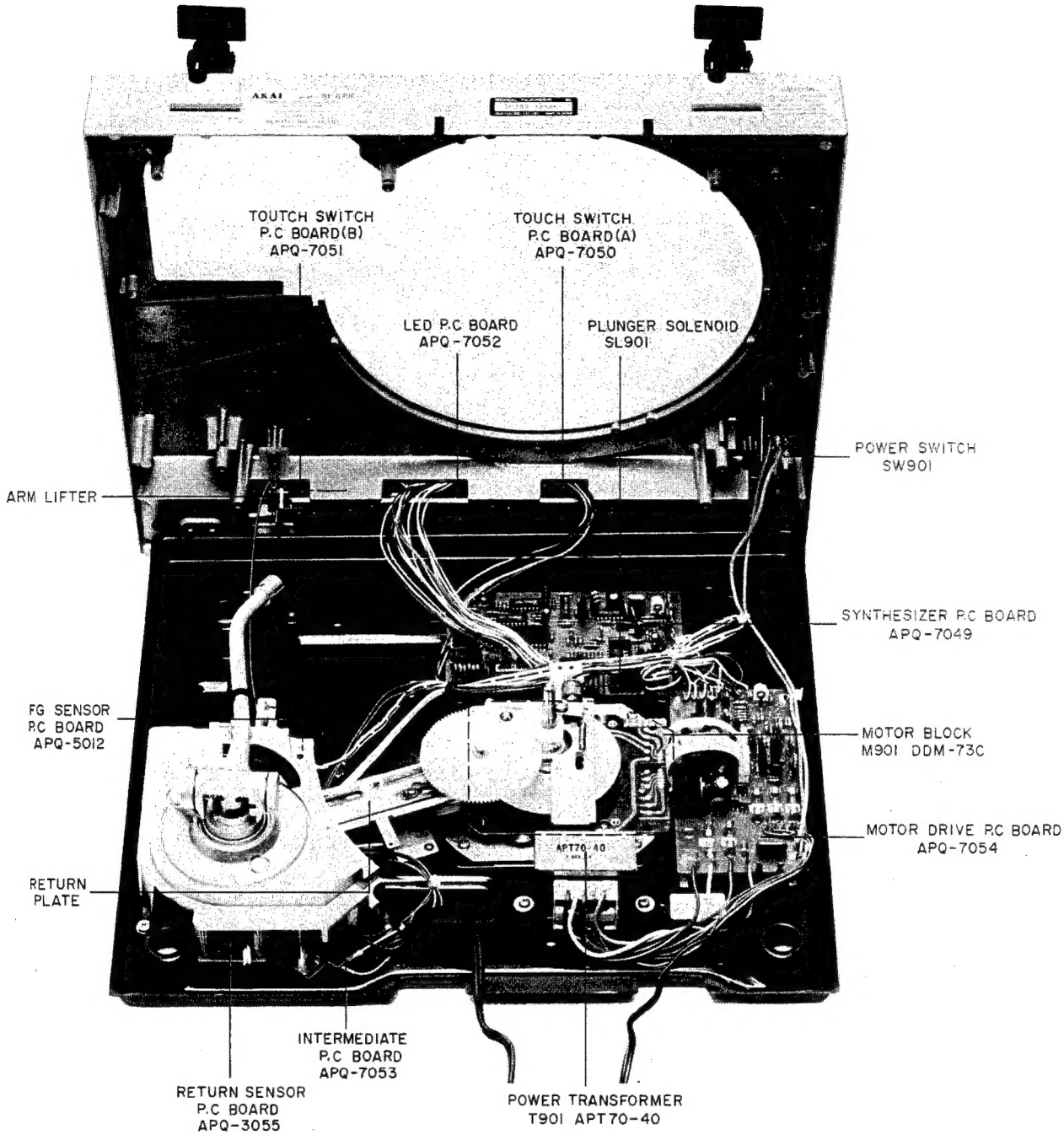



Fig. 2

# V. VOLTAGE CONVERSION

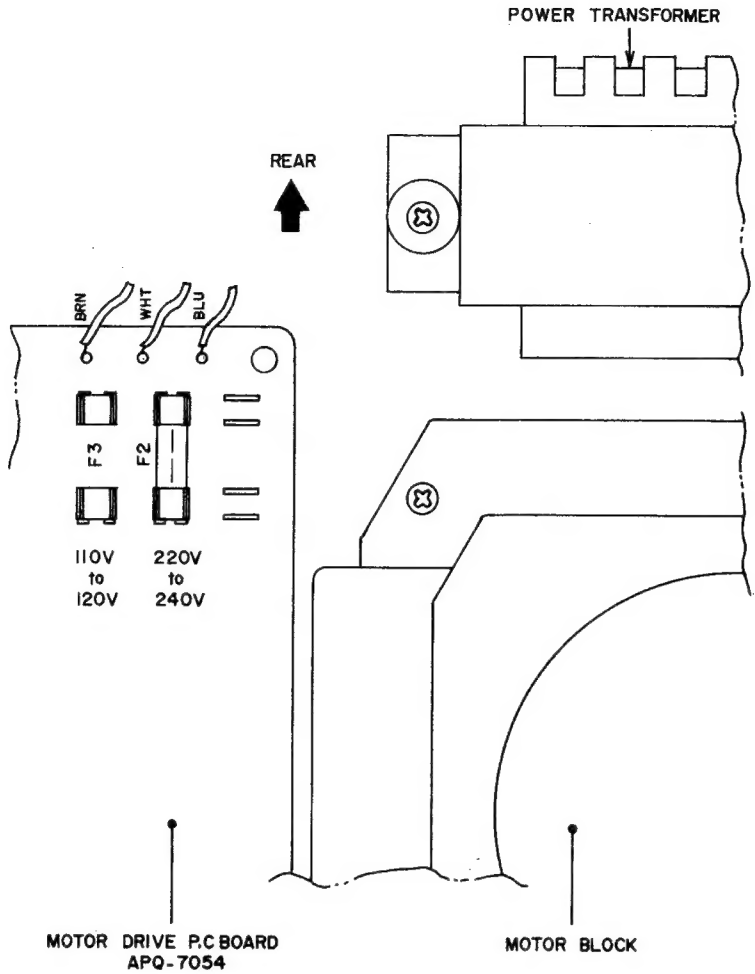



Fig. 3 Voltage Conversion (U/T Model only)

## 1. U/T MODEL (Refer to Fig. 1)

This unit can be set to 110–120 or 220–240V as required.

Each machine is preset at the factory according to its destination. However, if voltage conversion is necessary, it is accomplished as follows:

1. Remove power cord from mains supply.
2. Loosen holding screws and remove the motor cover.
3. Remove existing Line Voltage Fuse and insert required line Voltage Fuse in the proper fuse holder.

   F3: 110V to 120V T400mA
   F2: 220V to 240V T400mA

## 2. MODELS OTHER THAN U/T

No voltage conversion.

# VI. BLOCK DIAGRAM

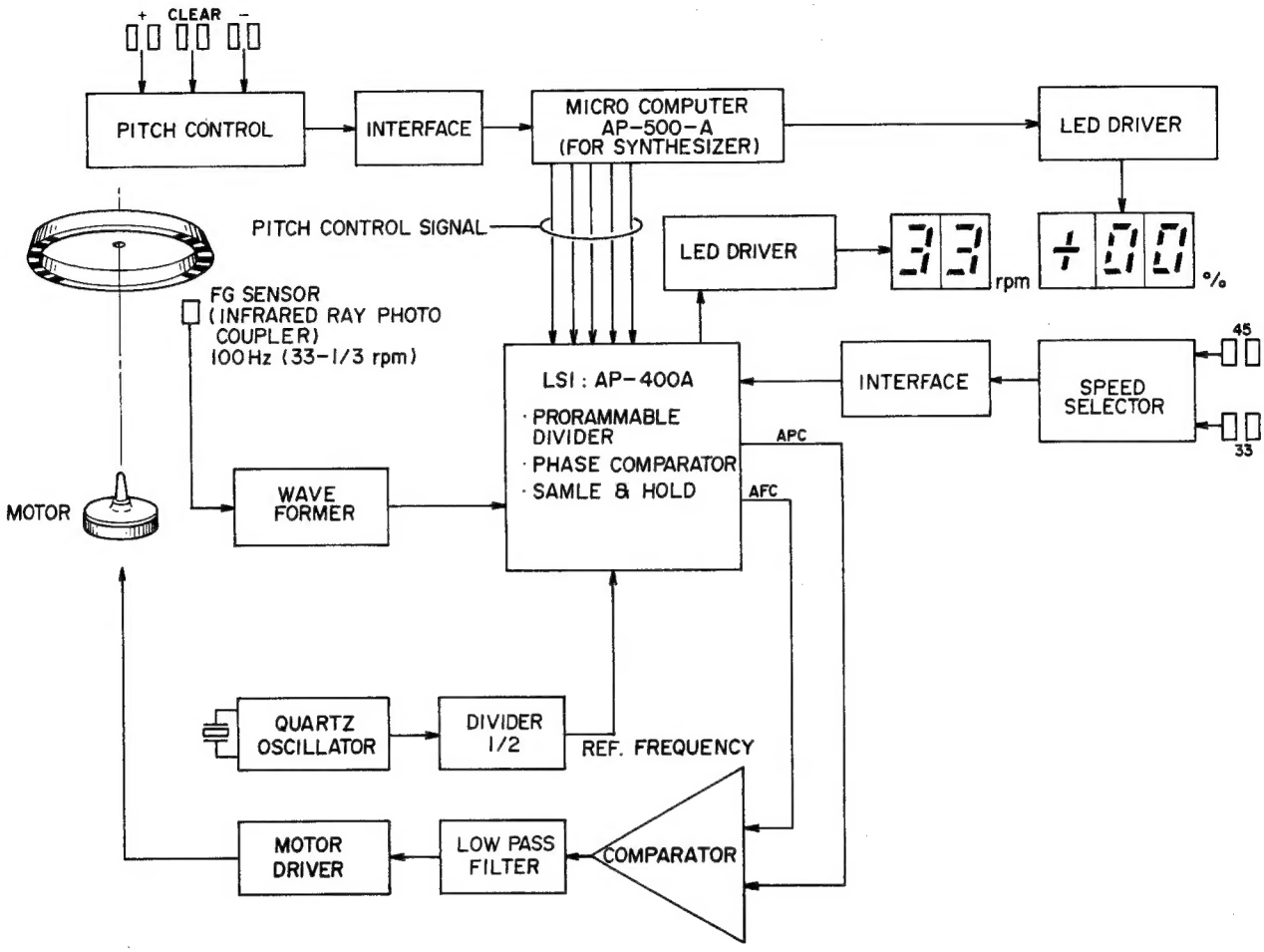



Fig. 4

# VII. EXPLANATION OF HOW THE COMPUTER WORKS

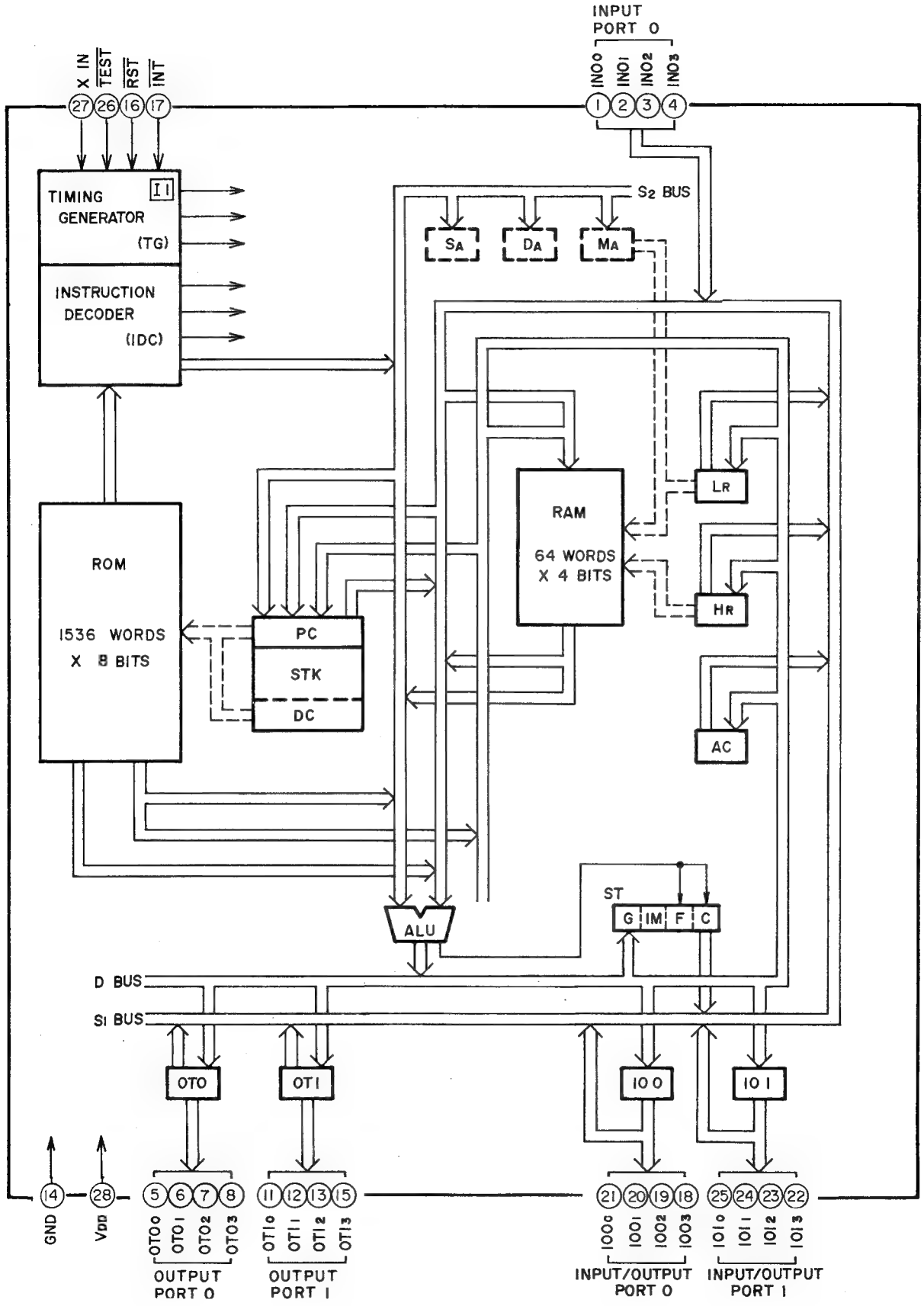



Fig. 5 Block diagram

## 1. TOUCH SWITCH SENSOR AND INDICATOR

The IC1, AP-500-A on the synthesizer p.c board plays the central role in sensing and displaying the states of the touch switches.

AP-500-A is a 4-bit microprocessor operating with 35 instructions, to sense and evaluate the states of the touch switches; display rpm and pitch data; and feed these data to the PLL LSI (AP-400-A) which controls the drive system.

Fig. 5 is the block diagram of AP-500-A, which has ① input terminal, ② output ports, and ③ input/output ports. AP-500-A receives and processes data coming through the input ports and delivers appropriate information to the output ports based on the programs stored in its ROM (read only memory) and assisted by the registers and the RAM (random access memory).

The input and output ports are connected with switches and LEDs via interfaces. Execution of the programs proceeds, synthronized by a clock pulse, in a fixed sequence which follows POWER ON RESET or by the regular timer insertions.

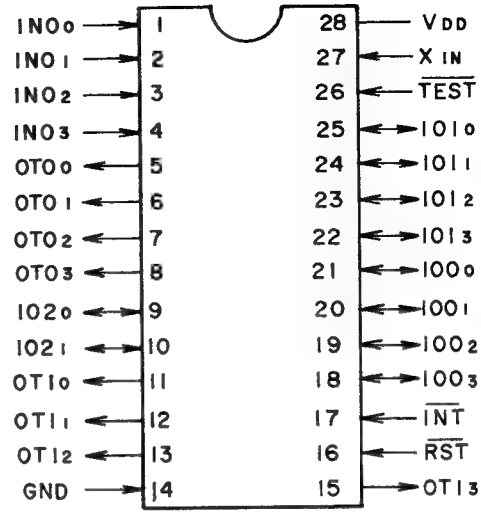



Fig. 6 Pin Configuration

| Pin No. | Pin Name | Function | Pin No. | Pin Name | Function |
|---|---|---|---|---|---|
| 1 | $IN0_0$ | (LSB) | 28 | $V_{DD}$ | Power Supply (5V) |
| 2 | $IN0_1$ | INPUT PORT 0 | 27 | $X_{IN}$ | Clock input |
| 3 | $IN0_2$ | 4 bit parallel input | 26 | $\overline{TEST}$ | Test terminal |
| 4 | $IN0_3$ | (MSB) | 25 | $IO1_0$ | (LSB) |
| 5 | $OT0_0$ | (LSB) | 24 | $IO1_1$ | INPUT/OUTPUT PORT 1 |
| 6 | $OT0_1$ | OUTPUT PORT 0 | 23 | $IO1_2$ | 4-bit parallel input/output |
| 7 | $OT0_2$ | 4-bit parallel output | 22 | $IO1_3$ | (MSB) |
| 8 | $OT0_3$ | (MSB) | 21 | $IO0_0$ | (LSB) |
| 9 | $IO2_0$ | (LSB) INPUT/OUTPUT PORT 2 | 20 | $IO0_1$ | INPUT/OUTPUT PORT 0 |
| 10 | $IO2_1$ | (MSB) 2-bit parallel input/output | 19 | $IO0_2$ | 4-bit parallel input/output |
| 11 | $OT1_0$ | (LSB) | 18 | $IO0_3$ | (MSB) |
| 12 | $OT1_1$ | OUTPUT PORT 1 4-bit parallel output combined with 15 pin | 17 | $\overline{INT}$ | Interrupt request |
| 13 | $OT1_2$ | | 16 | $\overline{RST}$ | Reset terminal |
| 14 | GND | Ground (0V) | 15 | $OT1_3$ | (HSB) |

Chart 1

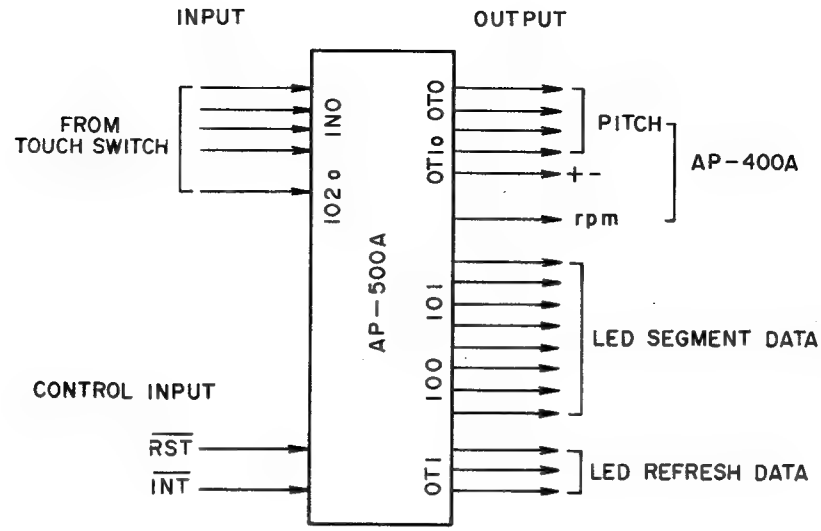



Fig. 7

**Operation of AP-500-A**

Four bits of input port 0 and one bit of input/output port 2, i.e. five bits in total, are assigned to input. The other ports are all assigned to output. The output ports are latched so that data fed out are kept stored until new settings occur. Fig. 7 shows input/output connections.

AP-500-A operates under the control of the programs stored in ROM, which are a main program and an interrupt processing program. The main program is started by POWER ON RESET and the interrupt processing program is prompted by timer insertions caused by hardware, connected to terminal INT, at regularly intervals of appr. once every 4 msec. Figs. 8 and 9 are flowcharts of the main and interrupt processing program.

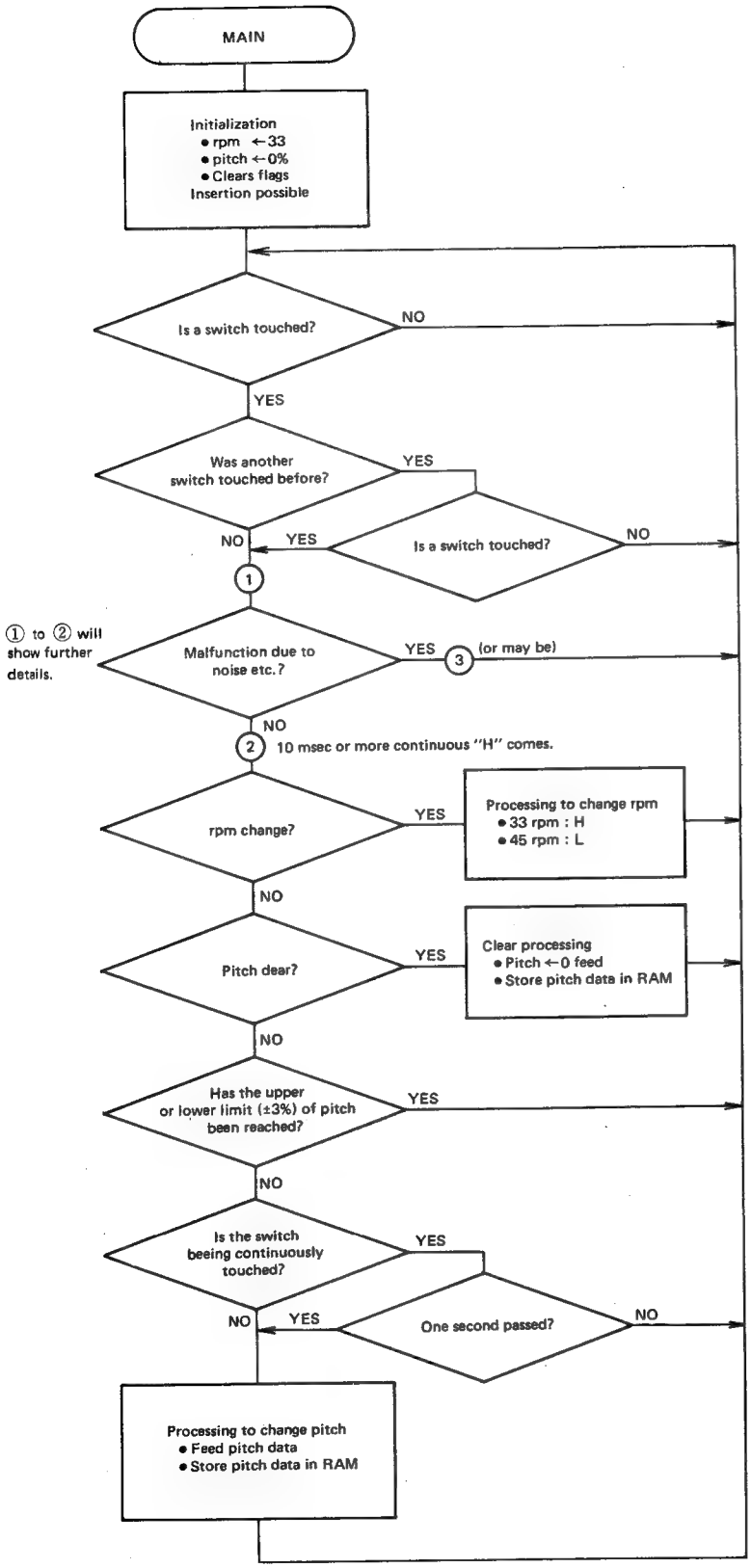



Fig. 8 Main Routine

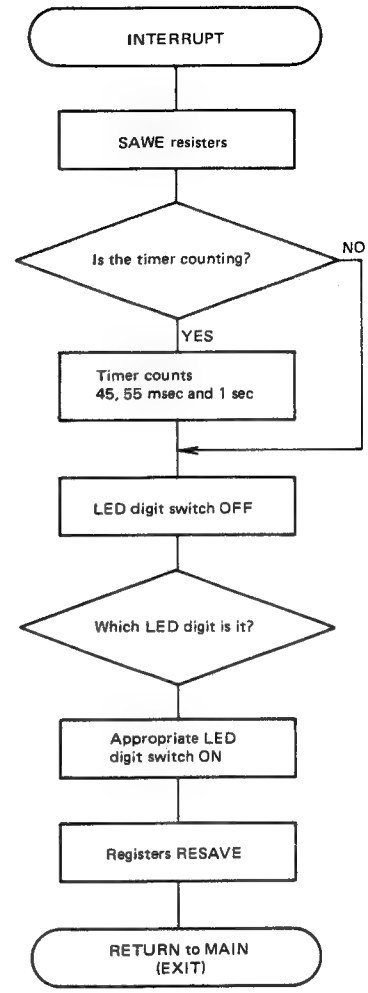



Fig. 9 Interrupt Routine

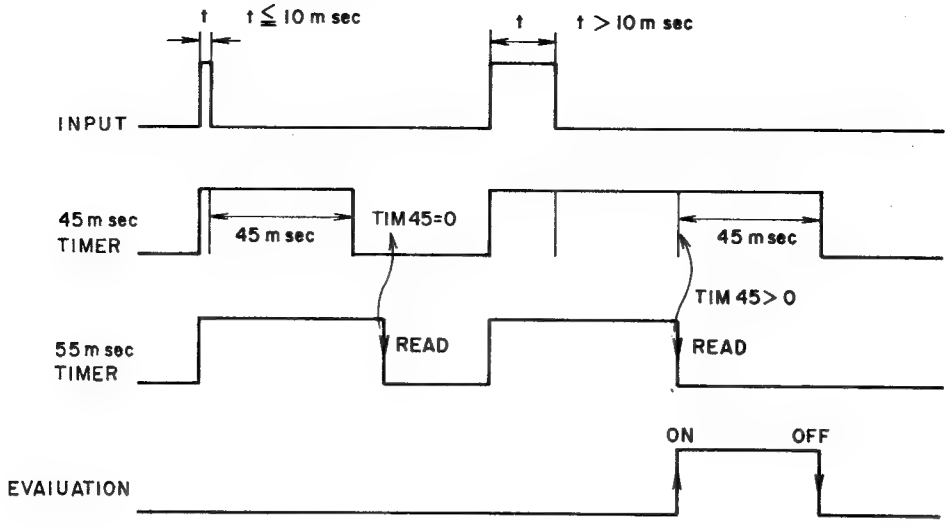



Fig. 10

## 1-1. Main program

When turning on the POWER switch, due to the time constant delay R33/C17 in the power supply mounted on the MOTOR DRIVE PCB (printed circuit board) the voltage at the RST terminals rises delayed from $V_{DD}$. Because of this RESET reaches the L level so that the main program starts by RESET JUMP.

The main program initializes the parameters of rpm and pitch and sets up the input and output ports, and then enters an endless loop in which it senses and evaluates the states of the touch switches during insertion, and feeds data about pitch etc. to the output ports.

Detection and evaluation of the ON state of a touch switch are carried out as described below.

The high input impedance of the CMOS inverter is employed to sense the state of a touch switch. The input of IC5 is brought to H level by a high value resistor. When the finger shorts the terminals of a switch, the input terminal of the associated inverter becomes "L" and the inverted output signal (H) is fed to an input port of AP-500-A. The main program detects the "H" level in the endless loop. The touch switch has a high impedance exposed and thus is liable to noise pick up. To cope with this problem, only an "H" level which is sustained for 10 msec or more is regarded as an input signal resulting from proper touch. The "H" level which is not kept for at least 10 msec is regarded as a result of noise. This scheme prevents the circuits from operating improperly, i.e. sensing false signals, due to hum induced the line frequency of 50 Hz (20 msec) or other pulse noises.

No input signals but CLEAR will be accepted for at least 100 msec after the occurrence of a proper touch input signal (or within 45 msec after switch-off).

Fig. 11 is the flowchart of detection and evaluation of input signals.

When the system detects that an input port is at the "H" level, a constant is stored in a certain portion of RAM and the timers are started (refer to the section of interrupt processing program). There are two types of timers: on (TIM45) counts in intervals of 45 msec and the other (TIM55) in intervals of 55 msec. TIM55 starts when "H" has been detected for the first time. TIM45 starts each time when "H" is detected in the loop (the cycle of the loop is very short compared with the cycle of interrupt). (TIM45 turns "0" in 45 msec after turn-off). A switch is judged turned on if the system finds TIM45 operating (TIM45 > 0) after TIM55 stops (TIM55 = 0). At this time, duration of the touch on the switch must be 10 msec or more.

When a proper input signal comes in, TIM45 start again when TIM45 is not zero, no input signals but CLEAR will be accepted for 45 msec after an input turns from "H" to "L". This eliminates the effect of chattering when a switch is turned off. Fig. 10 illustrate this operation.

The main program also controls malfunction of the timers and deals with the cases when one more than one switch are touched at the same time and when the pitch switch is kept depressed. Details are not explained. Refer to the flowcharts of Figs. 8 and 9.

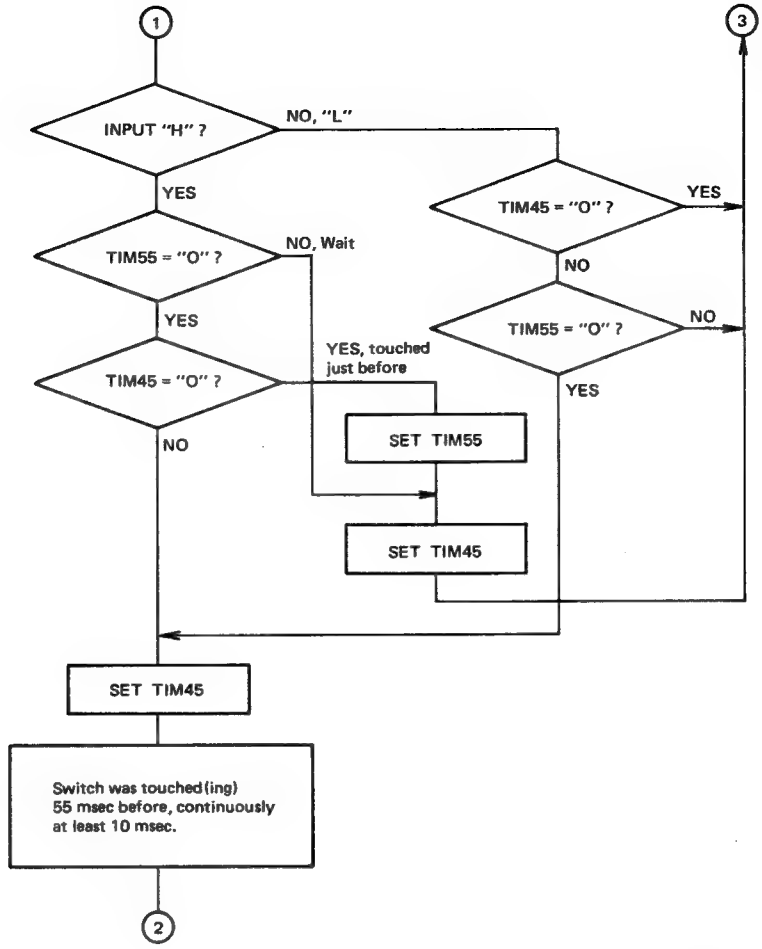



Fig. 11

By the procedure described above, modified data of pitch and rpm are sent to the output ports.

Pitch data are sent as a 4-bit binary number (000(0) ~ 1111(15)) to pins ⑧ through ⑪ of AP-400-A via port OT. A minus flag ("H" when minus) is sent to pin ⑫ from port OT1. Chart 2 shows the relations between pitch and binary data. The output data are latched until the arrival of new data, and they can be checked using a tester.

| Pitch % / Pin | 0 | 0.2 | 0.4 | 0.6 | 0.8 | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 | 2.2 | 2.4 | 2.6 | 2.8 | 3.0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ⑤ (LSB) | L | H | L | H | L | H | L | H | L | H | L | H | L | H | L | H |
| ⑥ | L | L | H | H | L | L | H | H | L | L | H | H | L | L | H | H |
| ⑦ | L | L | L | L | H | H | H | H | L | L | L | L | H | H | H | H |
| ⑧ (MSB) | L | L | L | L | L | L | L | L | H | H | H | H | H | H | H | H |
| Decimal | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| ⑪ | plus 0, minus 1 | | | | | | | | | | | | | | | |

Chart 2

## 1-2. Interrupt processing program

The waveform shown in Fig. 12 is applied to pin ⑰ of terminal INT from the oscillator circuit of IC6. As terminal $\overline{INT}$ falls from "H" to "L", the CPU interrupts execution of the main program and changes to the interrupt processing routine. Since the waveform applied to $\overline{INT}$ rises and falls in intervals of approximate 4 msec (250 times per second), the interrupt processing routine runs regularly in the same intervals.

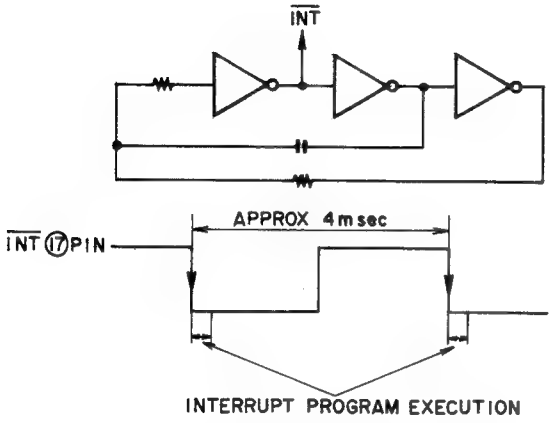



Fig. 12 $\overline{INT}$ Signal Oscillator and Waveform

The interrupt processing routine controls the timers and pitch LEDs according to the main program.

The routine reads the contents of a fixed location in RAM. If the data is not zero, the routine decreases it by one and stores the result in the same location. Fig. 13 shows the hardware and timing diagram of the pitch LED.

An interrupt cycle is divided into three periods of n, n+1, and n+2 drive the 3-digit LED display dynamically.

A 2-bit register is used and the pitch data is converted to the corresponding LED segment data (8 bits: 7 segments + period) before it is delivered to pins ⑱ through ㉕ of output ports IO1 and IO0, and signal LED ON for the ground common terminals of the LEDs is sent to output port OT1.

At each interrupt, LED3, LED4, and LED5 are lighted in turns. Due to the high speed of the cycle, the LEDs look like being lit constantly.

When "3" or "45" is displayed (with LED1 and LED2), data of 33 = "H" and 45 = "L", which are fed out via pin 10 by the main program, and data of 33 = "L" and 45 = "H", fed via AP-400-A, switch TR3 or TR4 to select the respective segments to be lit. At this time, signal LED ON1 at pin 12 is applied to TR5 so that the LEDs are lit only during cycle n (at the same time as LED3).

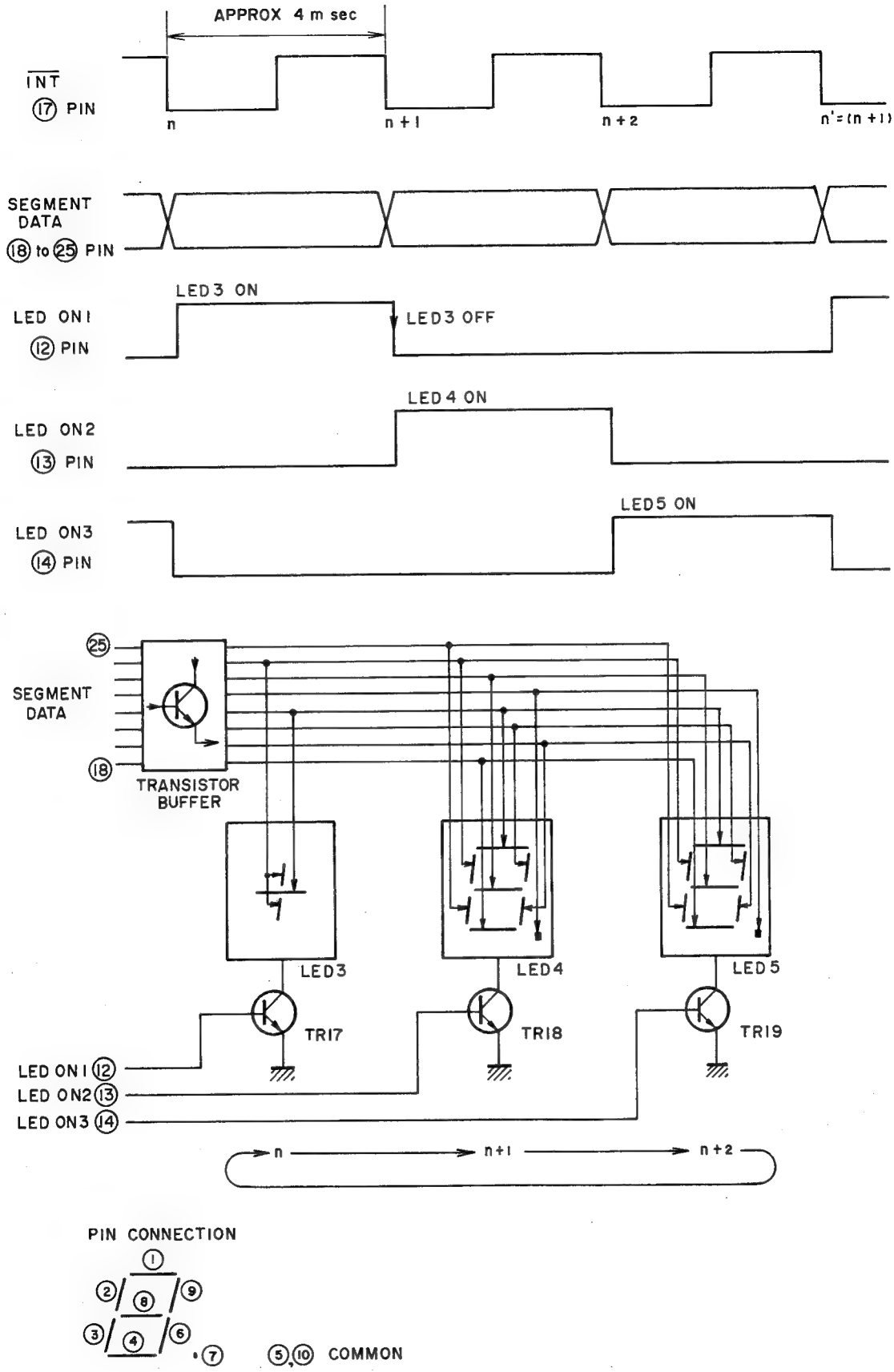

APPROX 4 m sec
INT
(17) PIN
n
n+1
n+2
n'=(n+1)
SEGMENT DATA
(18) to (25) PIN
LED3 ON
LED ON1
(12) PIN
LED3 OFF
LED4 ON
LED ON2
(13) PIN
LED5 ON
LED ON3
(14) PIN
(25)
SEGMENT DATA
(18)
TRANSISTOR BUFFER
LED3
LED4
LED5
TRI7
TRI8
TRI9
LED ON1 (12)
LED ON2 (13)
LED ON3 (14)
n
n+1
n+2
PIN CONNECTION
(1)
(2)
(8)
(9)
(3)
(4)
(6)
(7)
(5),(10) COMMON

Fig. 13

# VIII. EXPLANATION OF HOW THE SERVO CIRCUIT WORKS

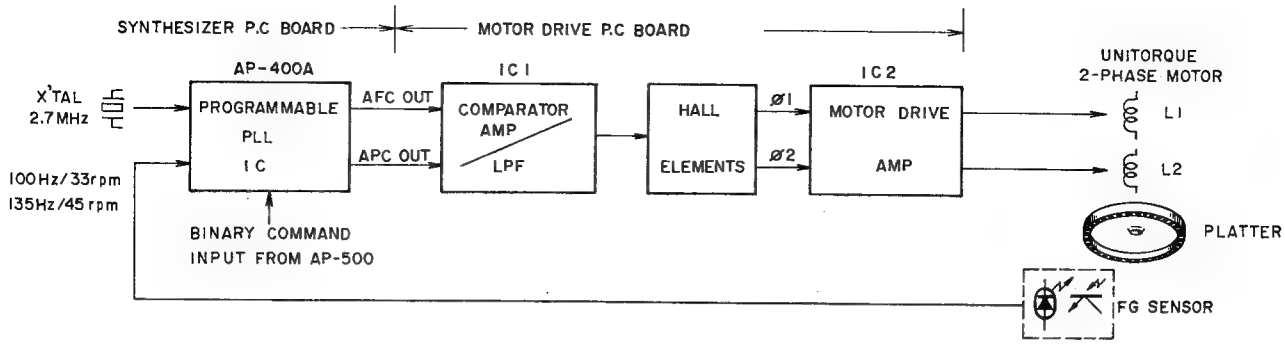



Fig. 14 Motor Servo Phase Lock Loop Diagram

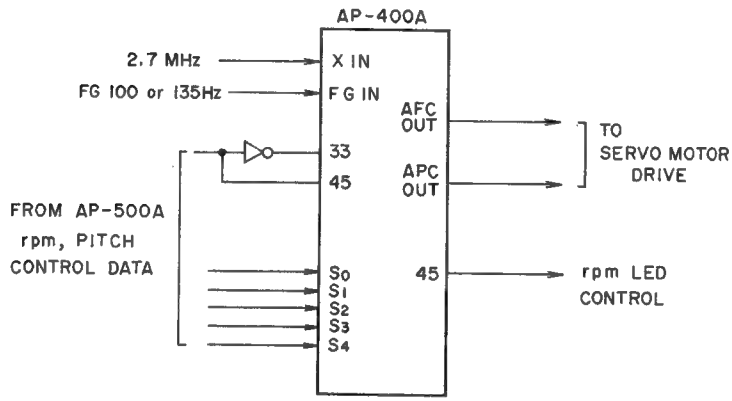



Fig. 15

Fig. 14 is the block diagram of the motor servo circuit. AP-400-A is a synthesized PLL LSI which compares a reference signal supplied by a quarts oscillator and the revolution speed signal detected by the FG sensor with reference to the rpm and pitch data (binary numbers) supplied by AP-500-A.

And it generates the voltages AFC OUT and APC OUT which are proportional to the revolution speed and the phase difference respectively.

Fig. 15 shows the input and output signals. Figs. 16 and 17 show the pin assignments and the block diagram of the LSI.

A photocoupler detects light reflected from the strobe pattern on the bottom of the platter. The FG frequency is 135 Hz at 45 rpm and 100 Hz at 33-1/3 rpm.

The reference frequency is 2.7 MHz which is generated by dividing the base frequency of 5.4 MHz by two.

Rpm is selected by making terminals 33IN or 45IN at "L".

For pitch control, the 4-bit binary number of S0 (LSB) to S3 (MSB), with a minus flag set up in S4, determines pitch in the range of 0% to 3% in steps of 0.2%. For details, see Chart 2 in Section 1, "Touch switch sensor and indicator".

APC OUT and AFC OUT are obtained by sampling and holding momentary values of a sawtooth wave which is generated by integrating a square wave with an external capacitor. The peak level of the sawtooth wave is proportional to the DC voltages applied to pins ⑯ and ㉒.

APC OUT and AFC OUT are applied to the comparator-amplifier of IC1 on the motor drive PCB and then applied to the base of TR1, via a low-pass filter, to control the collector current. This current is applied to a Hall element, ensuring that the output current of 2-phase motor drive amplifier IC2 is also proportional to it.

The motor drive amplifier IC2 is designed to have a frequency response which falls at low frequencies due to negative feedback given through a C-R circuit.

And so, the gain of the amplifier is reduced to protect the motor coil from excessive current when the motor coil is locked.

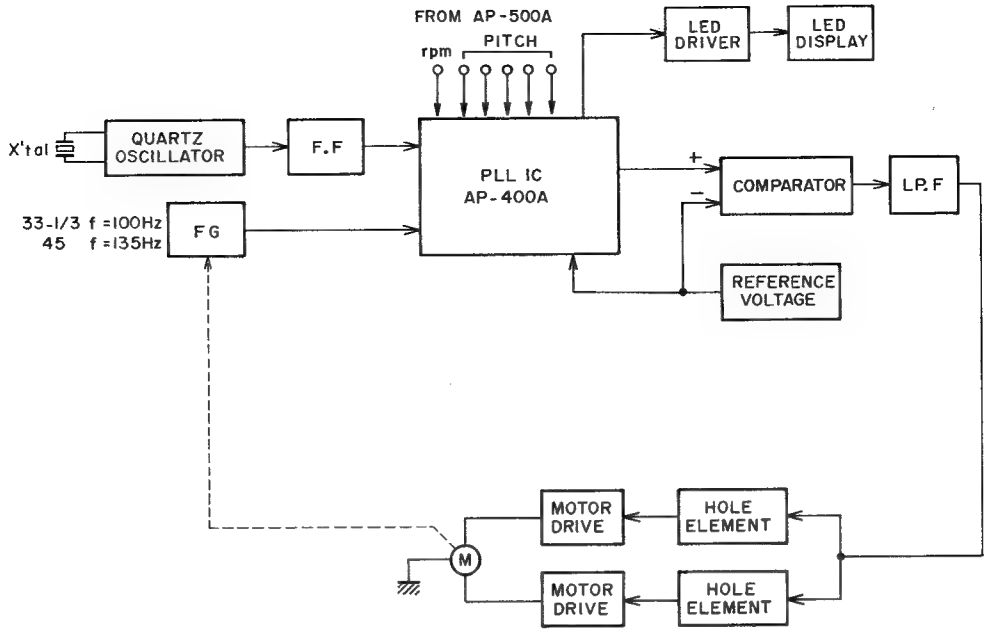



Fig. 16 Block Diagram

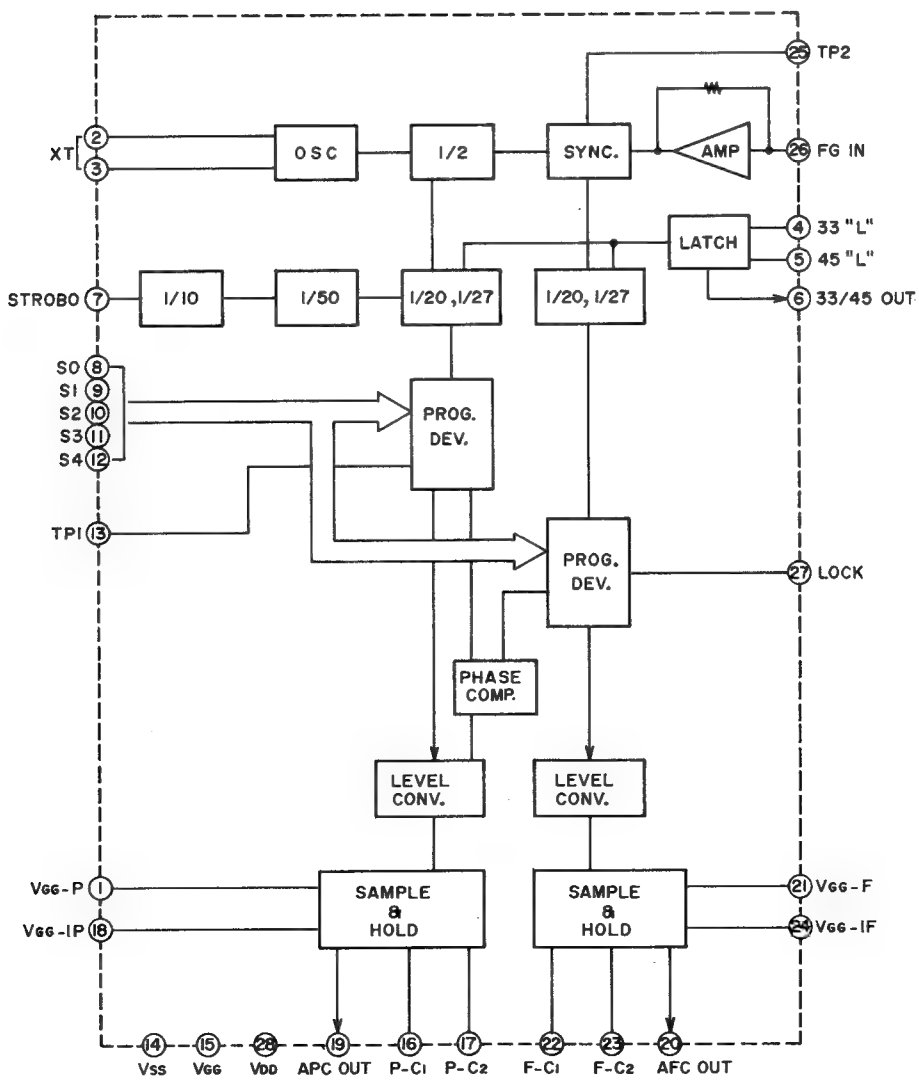



Fig. 17 Pin Connection

# IX. EXPLANATION OF HOW THE DC BRUSHLESS DD MOTOR (DDM-73C) WORKS

In the DD motor of AP-Q70/C, a Hall switching element is used to generate a smooth sine wave-like rotating magnetic field and to eliminate noise which conventional brushes might generate. In addition, use of 2-phase coils reduces variation of the driving torque which would otherwise vary with the rotor position, thus ensuring smooth rotation. Operation of the DDM-73C is briefly described below.

Fig. 18 shows the structure of the DDM-73C which is composed of 2-phase, star-shaped coils, eight magnetized rotor poles in NS alteration and the Hall devices at angles of 112.5°.

The Hall devices detect the sinus wave-like variation of the magnetic field occurring when the rotor rotates, and supply the coils with amplified drive currents.

Let us see how one of the coils works. Force F which the coil receives when current i flows (the magnetic pull becomes the actual driving torque) is as follows.

$$F = Bil$$

Where B is the flux density, and 1 the length of the coils which move across the magnetic flux.

The force (vector), which varies with the relative position of the coils and magnets, reaches a maximum in the case shown in Fig. 19-A and is cancelled in the case shown in Fig. 19-B.

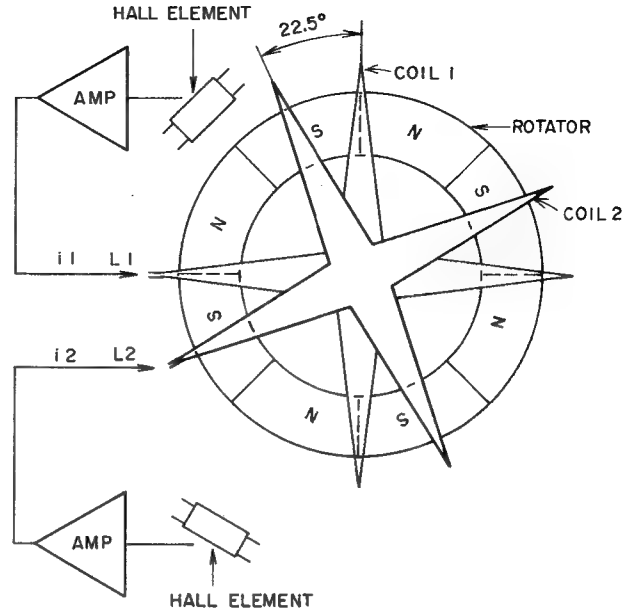



Fig. 18

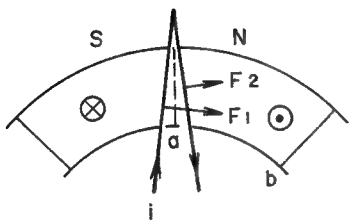



Fig. 19-A

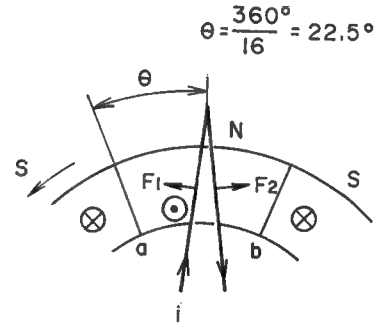



Fig. 19-B

The star shape of the coils causes the force to vary smoothly from maximum (case A) to minimum (case B) in the form of a sine wave. The variation of the force has a cycle which is equal to a quarter rotation, so the driving torque T1 with K as a constant is expressed as follows.

$$T1 = K \cdot il \sin 4\theta \quad \ldots\ldots\ldots\ldots \quad ①$$

On the other hand, current i counteracts variation of the magnetic field thus the following relation with I as a constant holds.

$$I = \sin 4\theta \quad \ldots\ldots\ldots\ldots\ldots\ldots ②$$

Thus, equations ① and ② give rise to

$$T1 = K \cdot I \sin^2 4\theta \quad \ldots\ldots\ldots\ldots ③$$

Fig. 20 shows this situation.

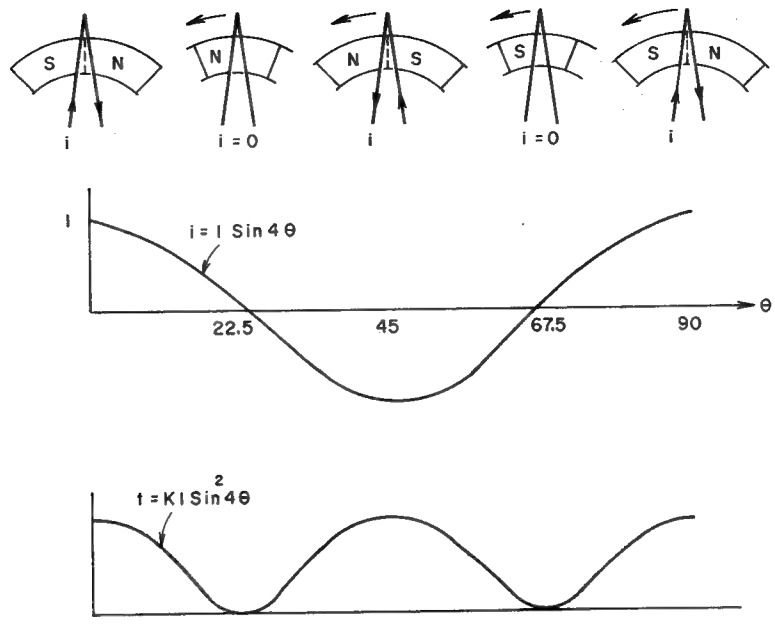



Fig. 20

The other coil is installed with a phase difference of $\pi/2$ (actually at an angle of 22.5°) to the first, and the positions of the associated Hall elements are shifted accordingly. So, current i2 which flows through the second coil is:

$$i2 = I \cos 4\theta \quad \ldots\ldots\ldots\ldots \quad ④$$

Driving torque T2 is:

$$T_2 = K \cdot i2 \cos 4\theta \quad \ldots\ldots\ldots\ldots \quad ⑤$$

Hence, from equations ④ and ⑤, we have:

$$T_2 = K \cdot I \cos 4\theta \quad \ldots\ldots\ldots\ldots \quad ⑥$$

Total driving torque, which is the sum of T1 and T2, is expressed as follows.

$$T_0 = T_1 + T_2 = K \cdot I (\sin^2 4\theta + \cos^2 4\theta) = K \cdot I$$

Thus the composite torque remains constant independently of the angle of rotation as shown in Fig. 21.

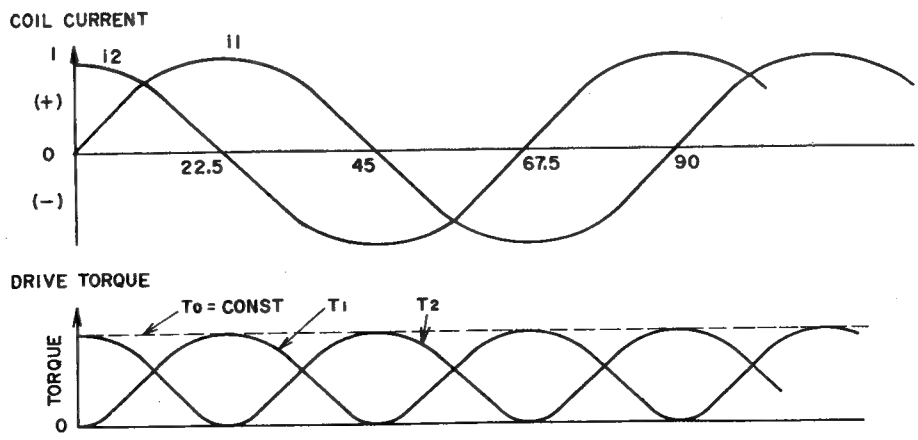



Fig. 21

# X. ELECTRICAL ADJUSTMENT

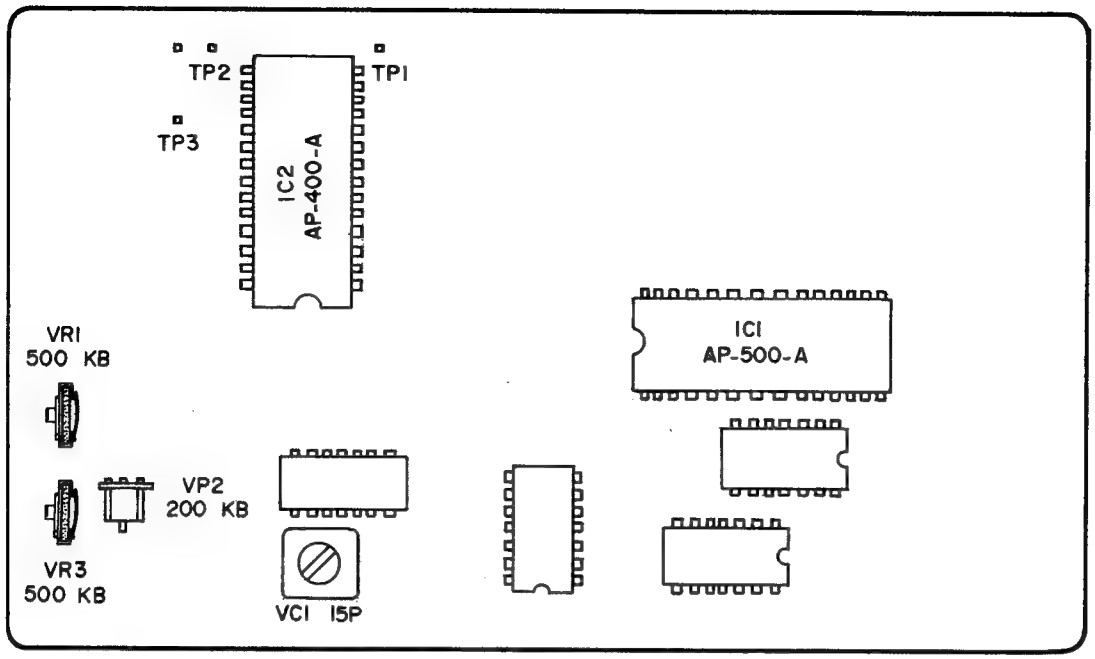



Fig. 22 Synthesizer P.C Board

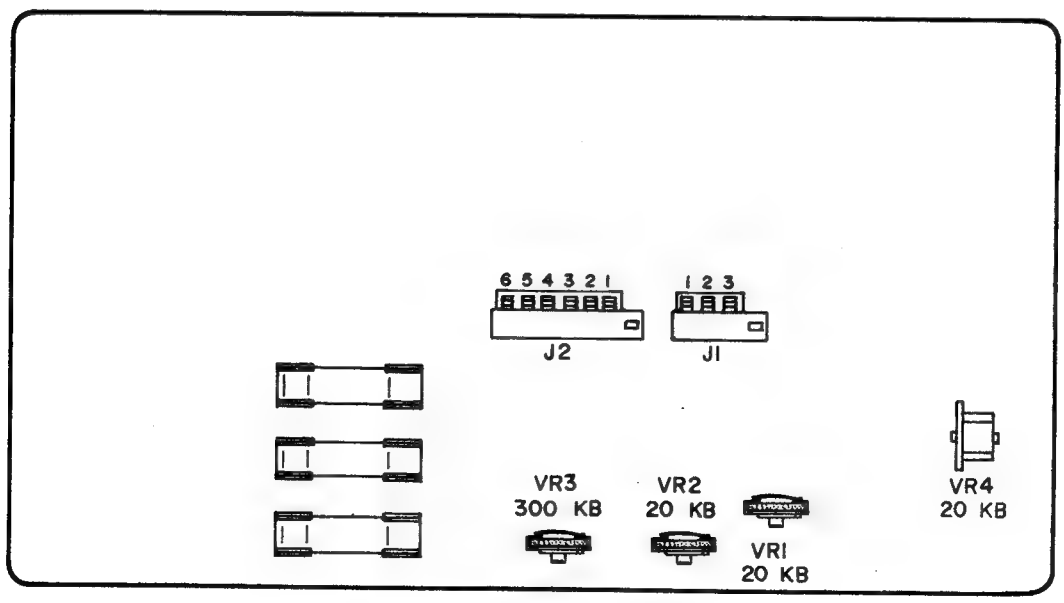



Fig. 23 Motor Drive P.C Board

## 1. X'TAL OSCILLATION FREQUENCY ADJUSTMENT (Refer to Fig. 22)

1) Connect a frequency counter to IC2 (AP-400-A)'s pin ② terminal.
2) Turn the power switch ON.
3) Adjust VC1 (15P) until the frequency counter reads 2.7 MHz ± 10 Hz.

## 2. QUARTZ LOCK ADJUSTMENT (Refer to Figs. 22, 24)

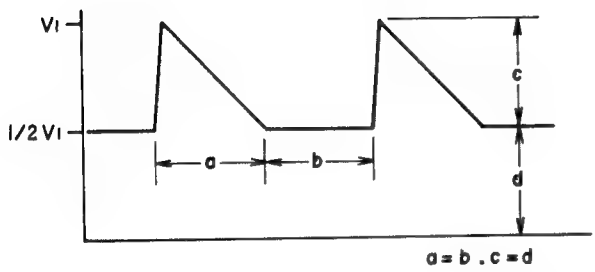



Fig. 24

1) Set the speed selector to 45 rpm and turn the power switch ON.
2) Move the tone arm to rotate the platter.
3) Connect an oscilloscope to test point TP3.
4) Adjust VR1 (500 kB) and VR3 (500 kB) to give the waveform shown in Fig. 24. Please move and adjust both volume controls as there is a tendency for the VR1 to change voltage and VR3 to change tilt.

## 3. OFF-SET VOLTAGE ADJUSTMENT AND TORQUE DIFFERENCE ADJUSTMENT (Refer to Fig. 23)

1) Remove the platter.
2) Disconnect the motor connection wires to J1 and J2.
3) Short J1 pins ①, ④ and ⑥.
4) Connect an oscilloscope to J1 pin ① and adjust VR1 (20 kB) to give DC −205 mV ± 5mV.
5) Short J2 pins ③, ④ and ⑤.
6) Set VR3 (300 kB) to the centre.
7) Connect an oscilloscope to J1 pin ③ and adjust VR2 (20 kB) to give DC −205 ± 5 mV.
8) Re-connect the motor connection wires to J1 and J2.
   Connect a 2ch AC voltmeter to J1 pins ①, ② (GND) and ③.
9) Replace the platter and move the tone arm to rotate the motor (45 rpm).
10) Adjust VR3 (300 kB) until the deflection of the AC voltmeter is the same.

**NOTE:** 1. The power switch should be off while shorting the terminals or disconnecting connection wires.
2. After adjustment, playback the 3,000 Hz test record and confirm that the Wow and Flutter is less than 0.025% (JIS).
   If out, re-adjust VR1 to 3.

## 4. PHASE ANGLE ADJUSTMENT (Refer to Figs. 22, and 25)

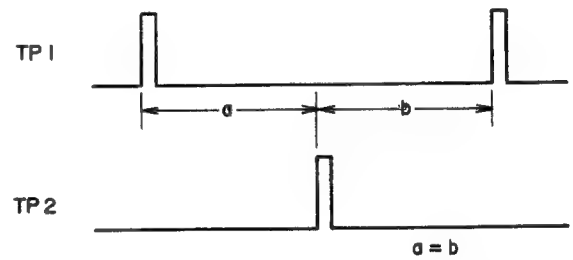



Fig. 25

1) Turn the power switch ON.
2) Set the speed selector to 45 rpm and move the tone arm to rotate the platter.
3) Connect the oscilloscope CH1 to TP1 and CH2 to TP2.
4) Adjust VR4 (20 kB) until waveform TP2 comes to the centre of waveform TP2.

# XI. MECHANICAL ADJUSTMENT

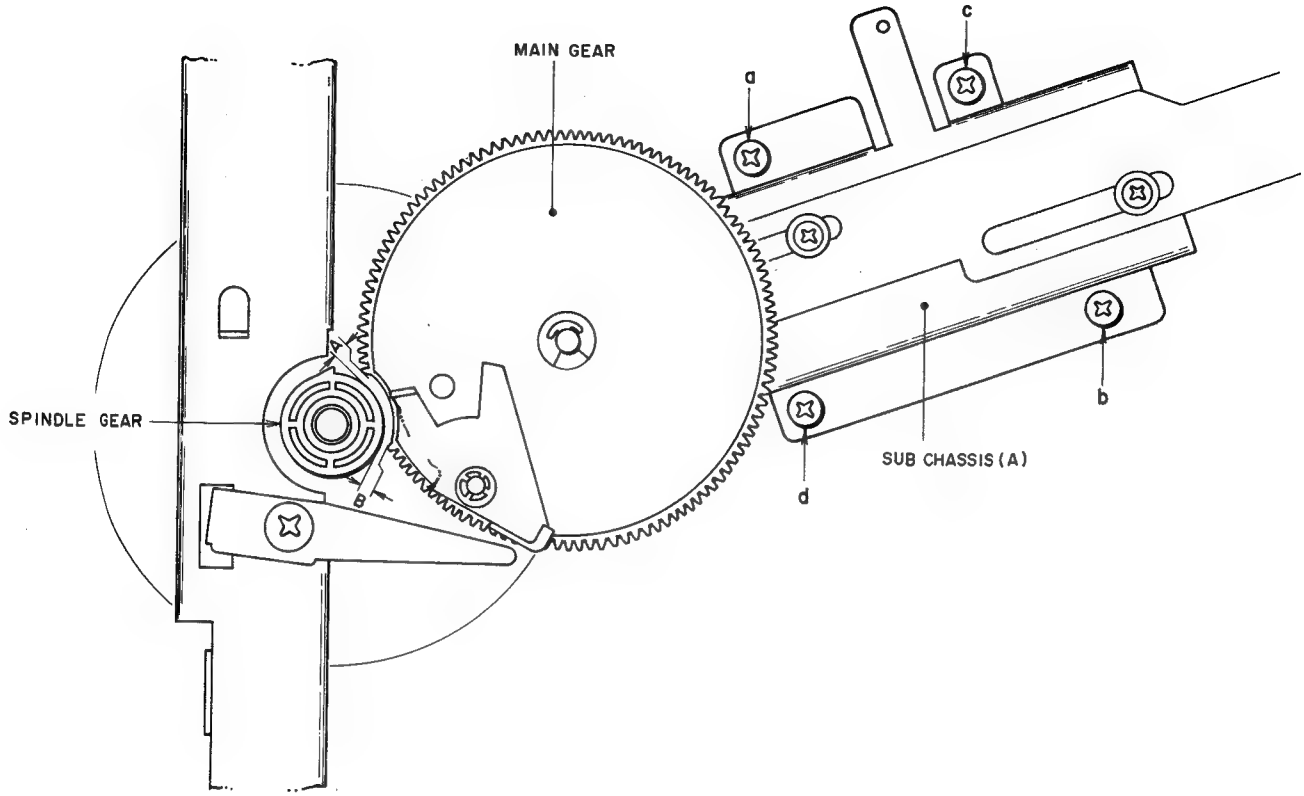



Fig. 26

## 1. THE MAIN GEAR INSTALLATION POSITION CHECKING (Refer to Fig. 26)

With the motor free, confirm that the gaps A and B between the spindle gear and main gear are equal. If not, loosen screws (a) to (d), move the sub chassis (A) and then tighten again.

## 2. RETURN PLUNGER INSTALLATION POSITION ADJUSTMENT (Refer to Fig. 27)

Depress the reject lever with a finger until the reject plate touches the spindle gear. See Fig. 27. Now, in this position, move the plunger (SL901) and adjust the installation screw until gap A between the reject lever and plunger is 0 to 0.5 mm. Turn the hook to which the spring is attached because sometimes the reject lever is not pulled back when the plunger is operated if the spring is too strong.

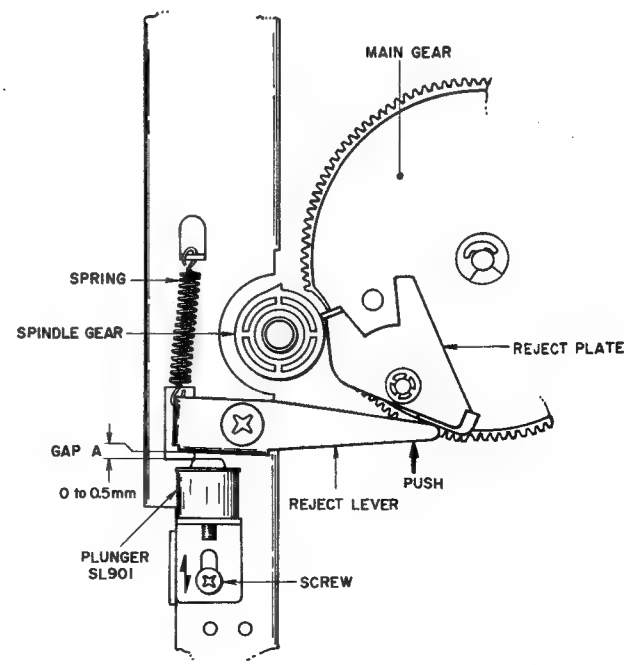



Fig. 27

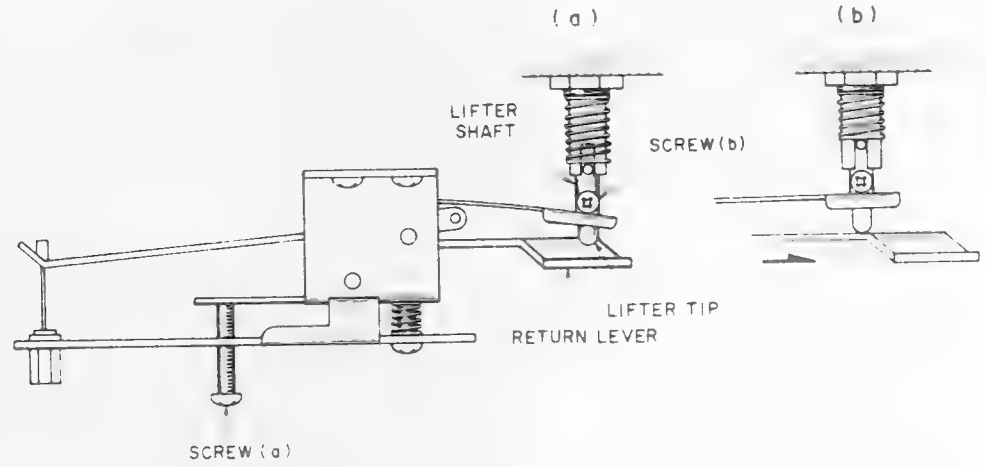



Fig. 28


Fig. 29

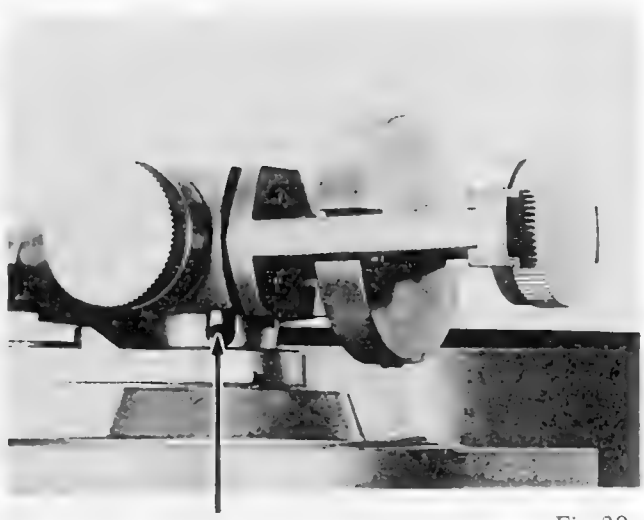



Fig. 30

### 3. TONE ARM LIFTER HEIGHT ADJUSTMENT (Refer to Figs. 28 and 29)

1) Turn the main gear by hand until the arm lifter is raised at auto-return (Fig. 28 (b)). Loosen screw (b) and push up the lifter shaft fully. Re-tighten screw (b) at the position where there is no gap between the return lever and lifter tip.
2) After assembly, place a record on the platter and adjust the arm lifter's height with screw (c) until there is an 8 mm gap between the stylus tip and record surface during auto-return.
(The arm lifter switch should be set to ▼).
3) Release the auto-return and set the arm lifter switch to ▼.
Adjust screw (a) through the adjustment hole on the rear cover until the arm lifter is fully raised.

### 4. TONE ARM HEIGHT ADJUSTMENT (Refer to Fig. 30)

The Tone Arm should be parallel with the record surface.
To adjust the arm height, insert the hexagon wrench into the adjustment hole (see Fig. 30) and turn. Adjustment of up to 5 mm is possible.

## 5. TONE ARM REST HEIGHT ADJUSTMENT (Refer to Fig. 31)

With the Arm Lifter Switch set to ( ▼ ), use the Tone Arm Height Adjustment Screw to adjust the Tone Arm Lifter to the same height as the Tone Arm Rest.

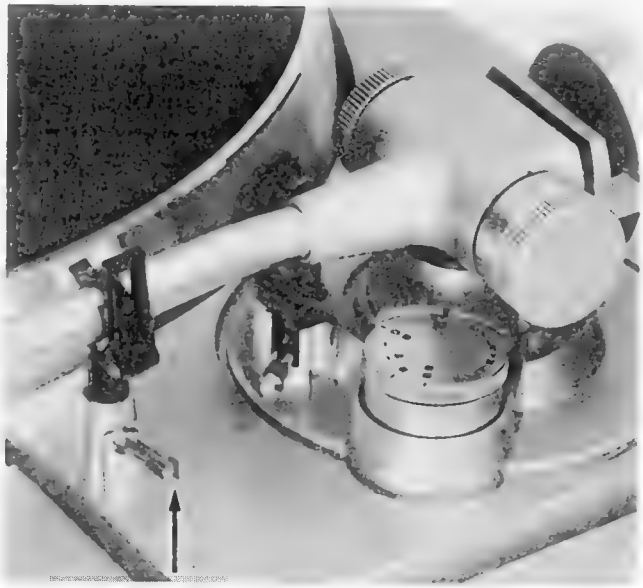



Fig. 31

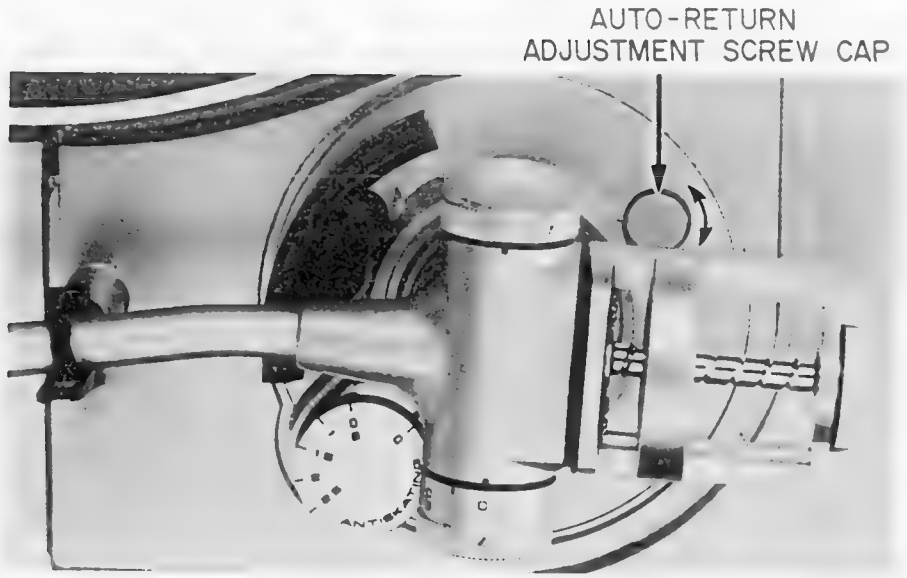



Fig. 32

## 6. AUTO-RETURN ADJUSTMENT (Refer to Figs. 32 and 33)

1) Turn the power switch ON and set the speed selector to 33-1/3 rpm.
2) Remove the auto-return adjustment screw cap.
3) Move the tone arm manually in the direction of the spindle and adjust the auto-return adjustment screw until there is auto-return when the stylus reaches the auto-return adjustment groove on the rubber mat.

**NOTE:** The auto-return adjustment screw is visible if the tone arm has been moved about 1 cm from the tone arm rest. Turn clockwise to alter the auto-return position towards the inside and counter-clockwise to alter to the outside.

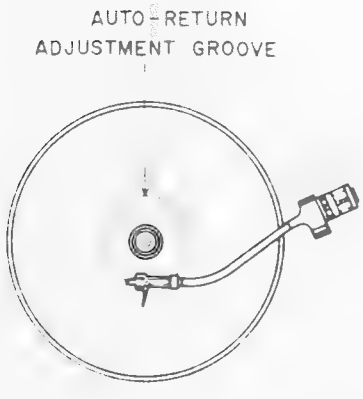



Fig. 33

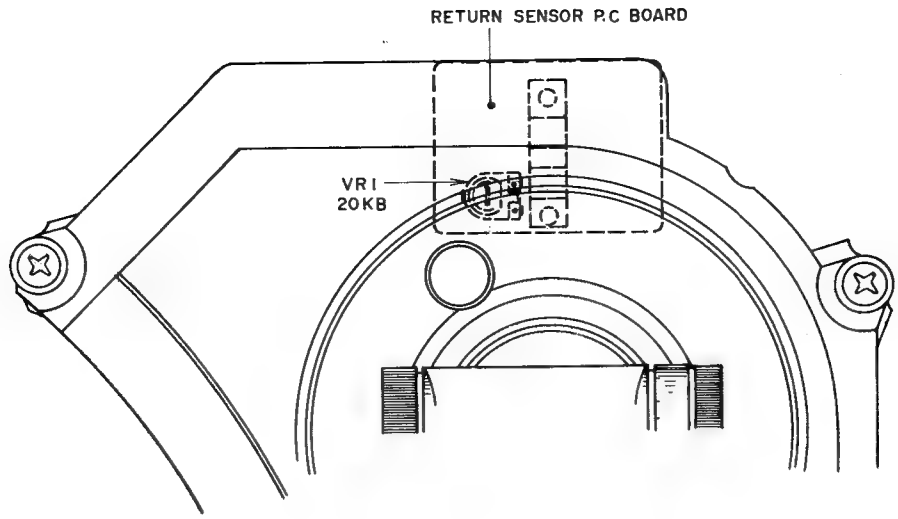



Fig. 35

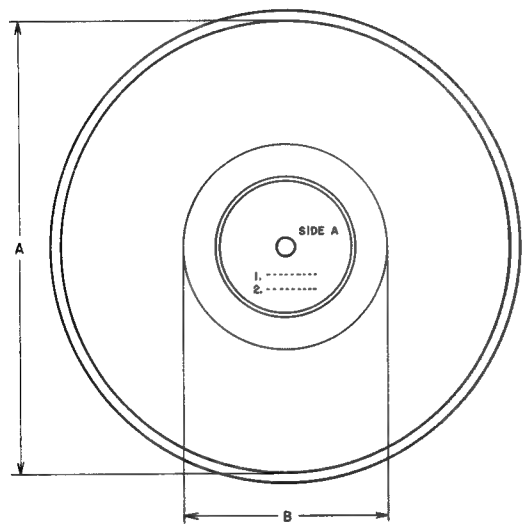



Fig. 34

## 7. RETURN SENSOR ADJUSTMENT
**(Refer to Figs. 22, 34 and 35)**

1) After adjusting V-6, playback a 30 cm or 25 cm (33-1/3 rpm) and 17 cm (45 rpm) records.
2) Adjust VR2 (200 kB) until the stylus is lifted up at an appropriate point on the lead-out groove.

**NOTE:** The range B or lead-out groove on which the stylus is to be lifted up is (Refer to Fig. 34):
* 109 to 115 mm diameter for 30 and 25 cm disks.
* 98 to 106 mm diameter for 17 cm disks.

**CAUTION:** Do not use any disk or phono sheet other than the one complying with the JIS standard or equivalent disk for this adjustment.

3) If the adjustment is not completed by VR2 (200 kB) turn VR1 (20 kB) on the Return Sensor P.C Board slightly and then re-adjust VR2 as in 2).

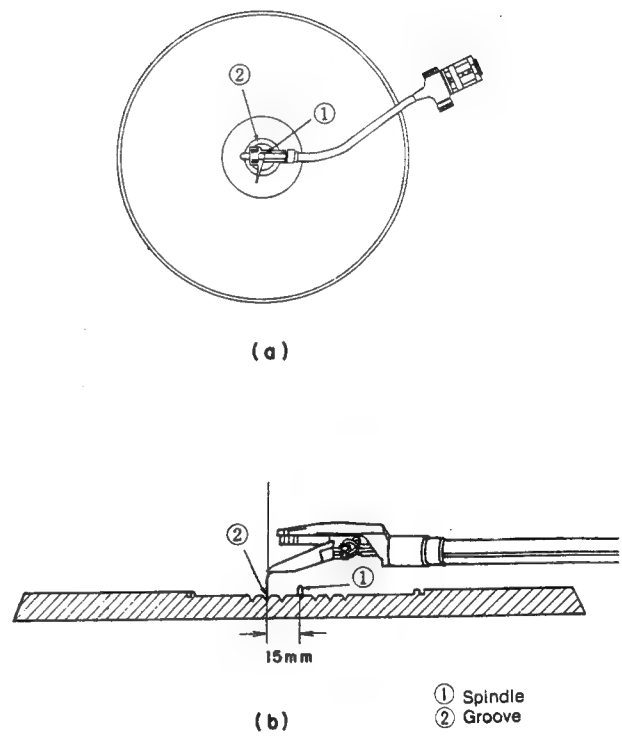



Fig. 36

## 8. OVERHANG ADJUSTMENT
**(Refer to Fig. 36)**

1) Disconnect the Power Cord.
2) Move the Tone Arm to the center of turntable.
3) Adjust the cartridge position so that the stylus is in line with the Middle Groove Ring.
* The cartridge position can be adjusted by re-setting the Cartridge Re-setting Screws.


Fig. 37

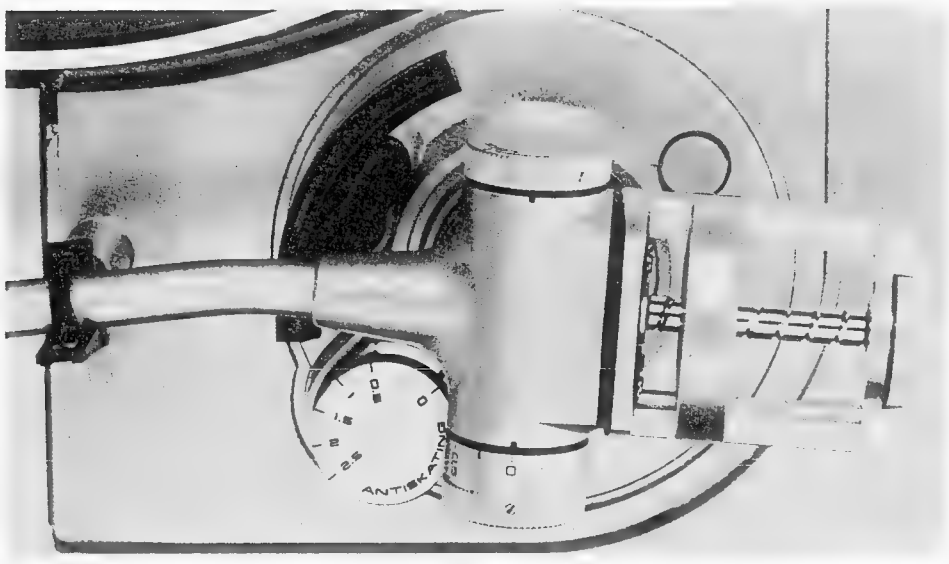


Fig. 38

## 9. STYLUS PRESSURE ADJUSTMENT
**(Refer to Figs. 37, 38)**

1) Disconnect power.
2) Turn the Anti-Skating Adjuster and Stylus Pressure Adjuster to 0 and make sure the Arm Lifter Switch is set at ( ▼ ).
3) Unlock the Tone Arm and move towards the turntable.
4) Keep the Tone Arm stationary halfway between the Tone Arm Rest and the Turntable Platter and adjust the ballast until perfect horizontal balance is obtained. To increase ballast weight, turn clockwise. To decrease weight turn counterclockwise.
5) Return Tone Arm to Tone Arm Rest. Lock Tone Arm and set stylus pressure weight recommended for your cartridge with the Stylus pressure Adjuster only. The adjustment range is from 0 to 2.5 grams.
   * For AP-Q70C only: The stylus pressure for the supplied Ortofon LMB 12 stylus is 1.5 grams.
6) Set the Anti-Skating Adjuster to corresponding stylus pressure weight.

# XII. CLASSIFICATION OF VARIOUS P.C BOARDS

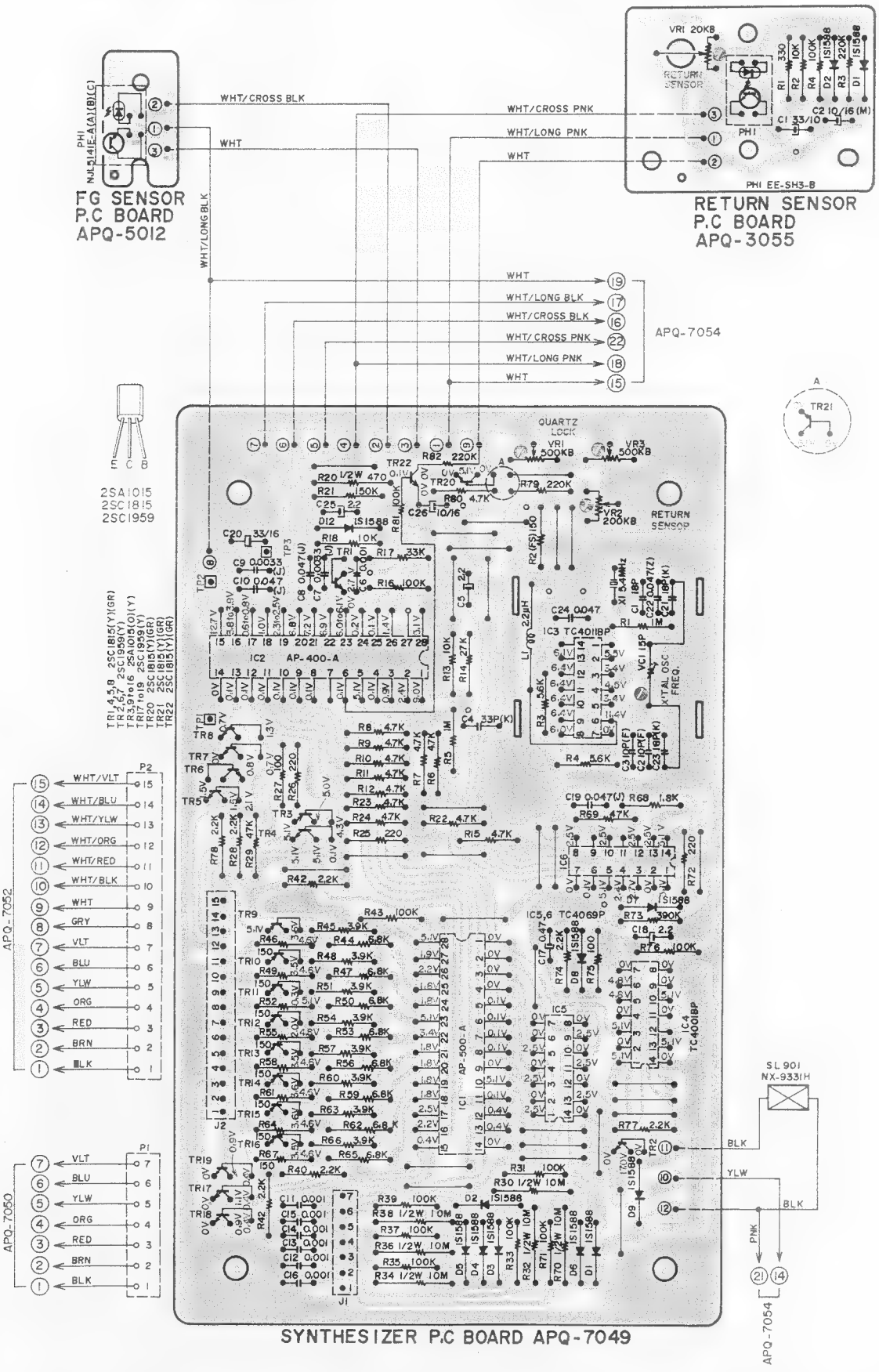
## 1. P.C BOARD TITLES AND IDENTIFICATION NUMBERS

| P.C Board Title | P.C Board Number |
|---|---|
| Touch Switch P.C Board (A) | APQ-7050 |
| Touch Switch P.C Board (B) | APQ-7051 |
| LED P.C Board | APQ-7052 |
| Intermediate P.C Board | APQ-7053 |
| Motor Drive P.C Board | APQ-7054 |
| Synthesizer P.C Board | APQ-7049 |
| FG Sensor P.C Board | APQ-5012 |
| Return Sensor P.C Board | APQ-3055 |

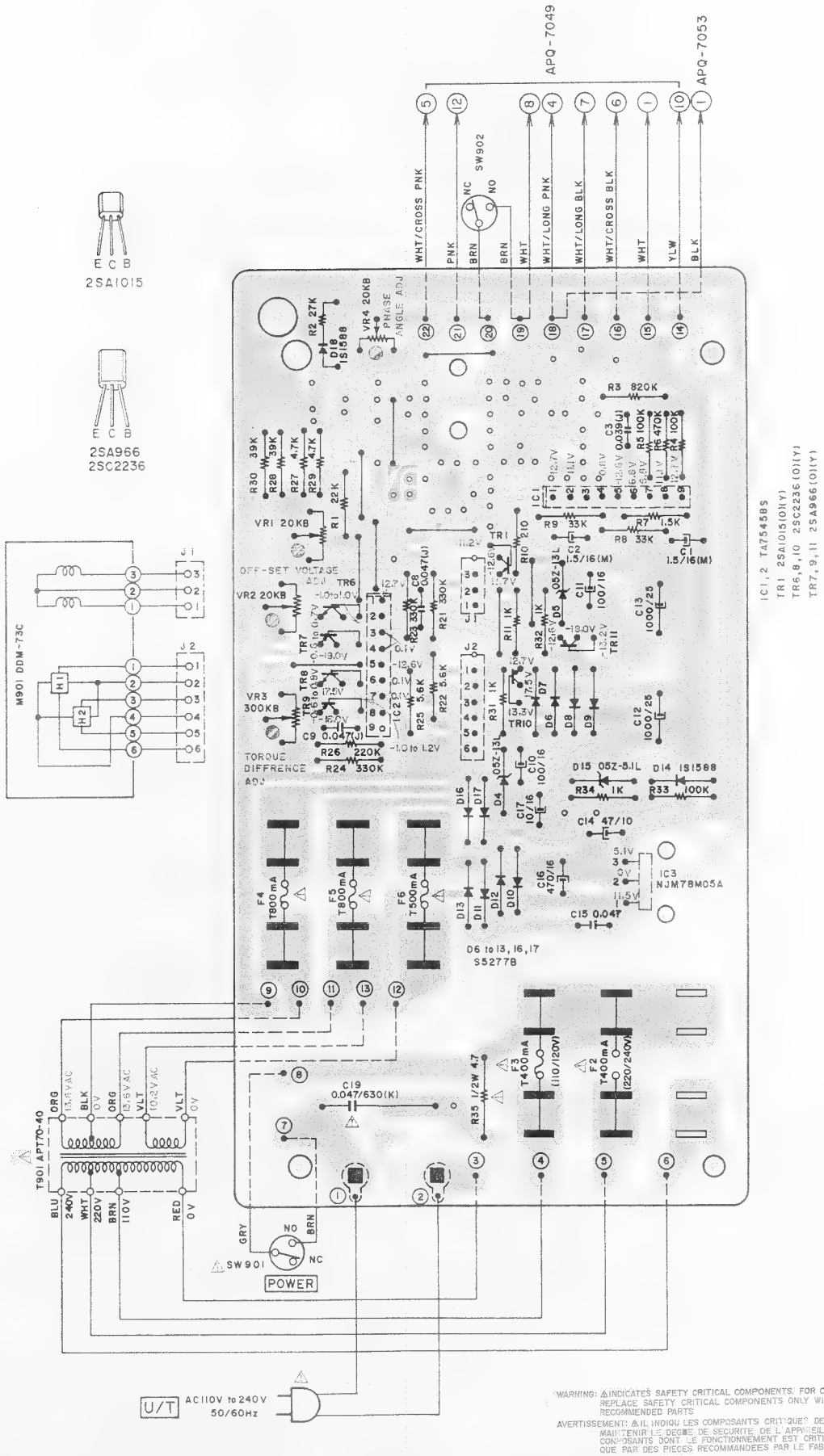
Chart 3

## 2. COMPOSITION OF VARIOUS P.C BOARDS

### 1) SYNTHESIZER P.C BOARD APQ-7049, RETURN SENSOR P.C BOARD APQ-3055 and FG SENSOR P.C BOARD APQ-5012



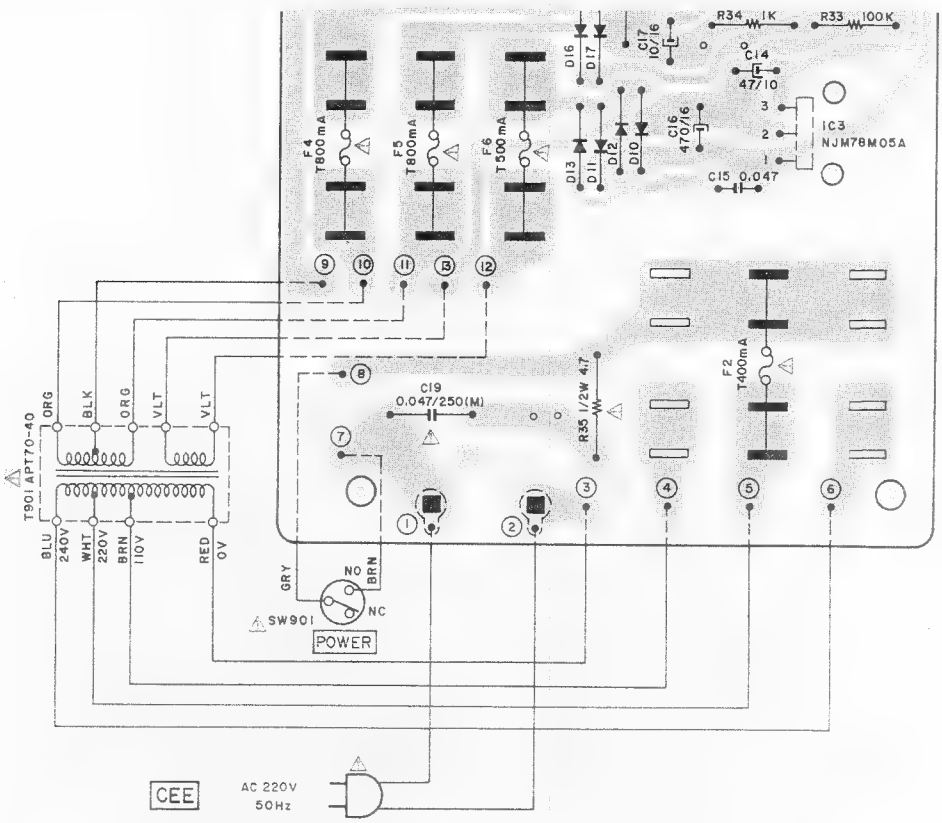
## 2) MOTOR DRIVE P.C BOARD APQ-7054 (U/T)



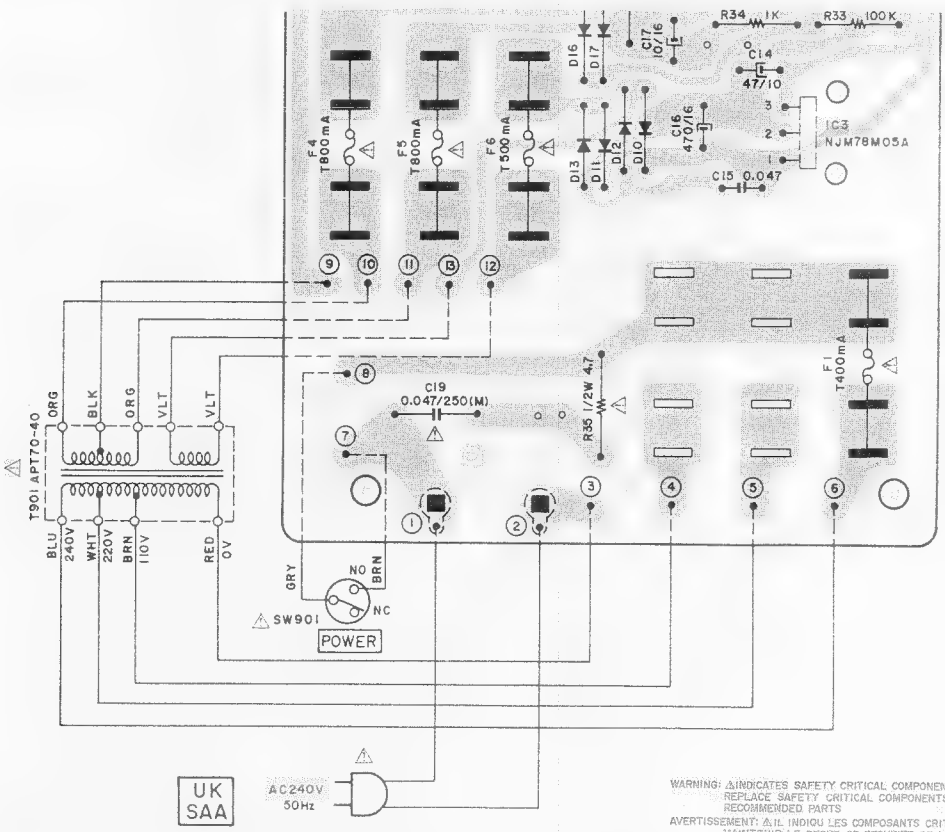

WARNING: ⚠INDICATES SAFETY CRITICAL COMPONENTS. FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS

AVERTISSEMENT: ⚠ IL INDIQU LES COMPOSANTS CRITIQUES DE SÛRETÉ. POUR MAINTENIR LE DEGRÉ DE SECURITÉ DE L'APPAREIL NE REMPLACER LES COMPOSANTS DONT LE FONCTIONNEMENT EST CRITIQUE POUR LA SECURITÉ QUE PAR DES PIÈCES RECOMMANDÉES PAR LE FABRICANT

## 3) MOTOR DRIVE P.C BOARD APQ-7054 (CEE)



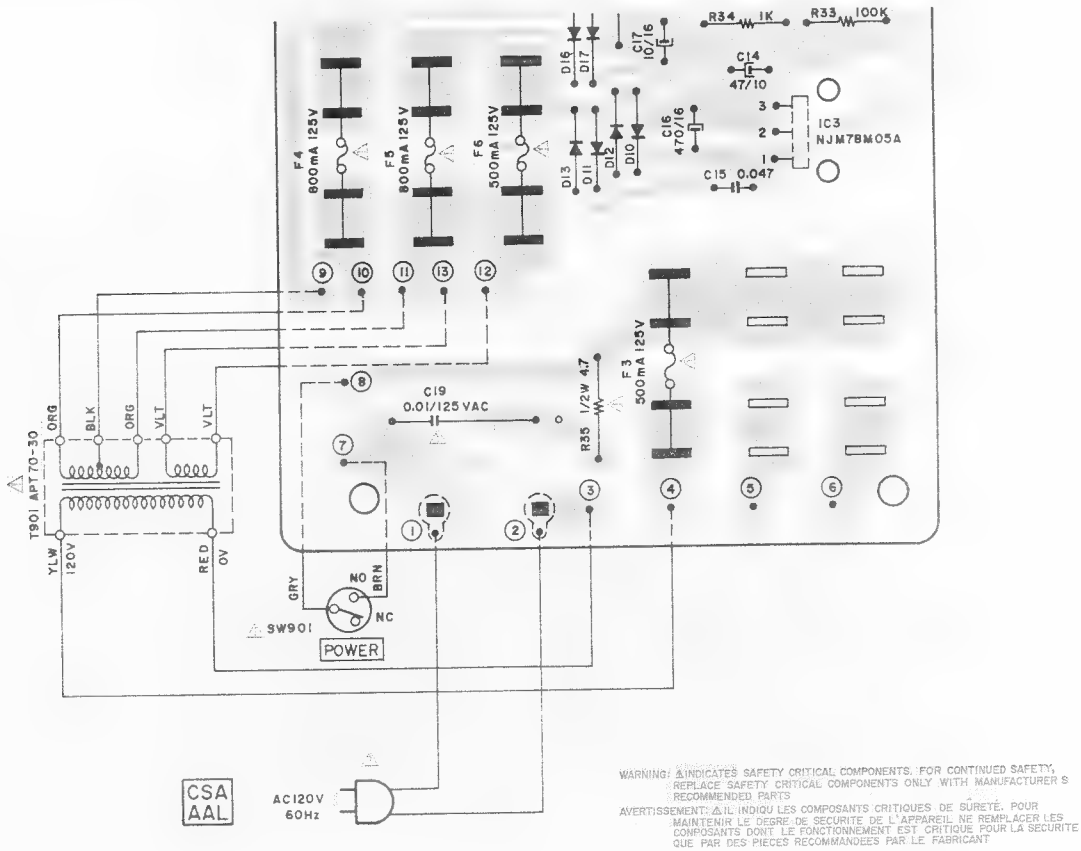

## 4) MOTOR DRIVE P.C BOARD APQ-7054 (UK, SAA)



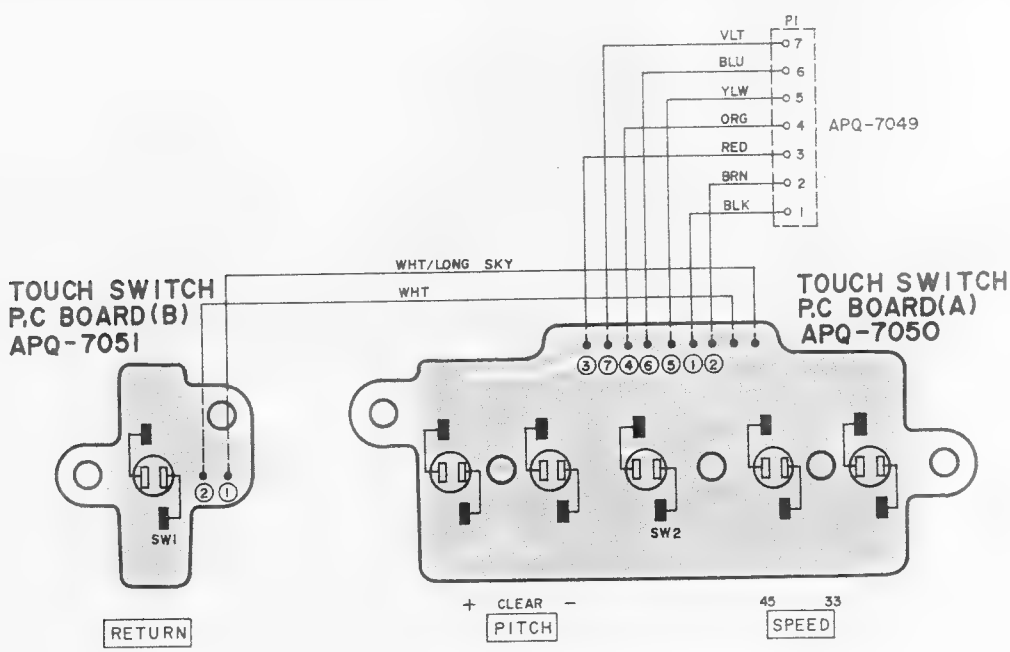

WARNING: ⚠INDICATES SAFETY CRITICAL COMPONENTS. FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS

AVERTISSEMENT: ⚠IL INDIQU LES COMPOSANTS CRITIQUES DE SURETÉ. POUR MAINTENIR LE DEGRE DE SECURITE DE L'APPAREIL NE REMPLACER LES COMPOSANTS DONT LE FONCTIONNEMENT EST CRITIQUE POUR LA SECURITE QUE PAR DES PIECES RECOMMANDEES PAR LE FABRICANT

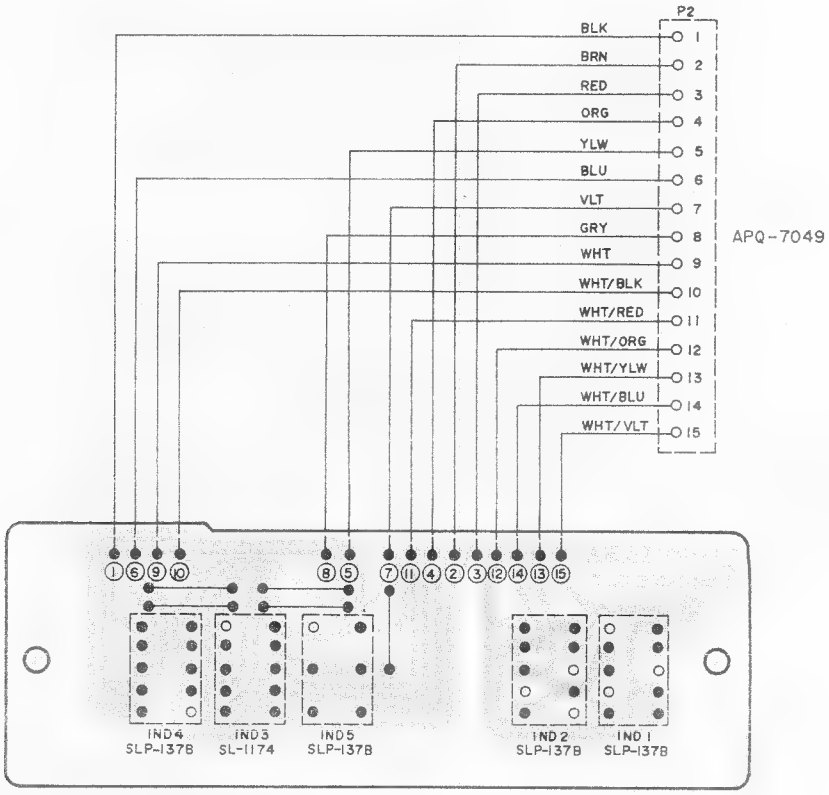
## 5) MOTOR DRIVE P.C BOARD APQ-7054 (CSA, AAL)



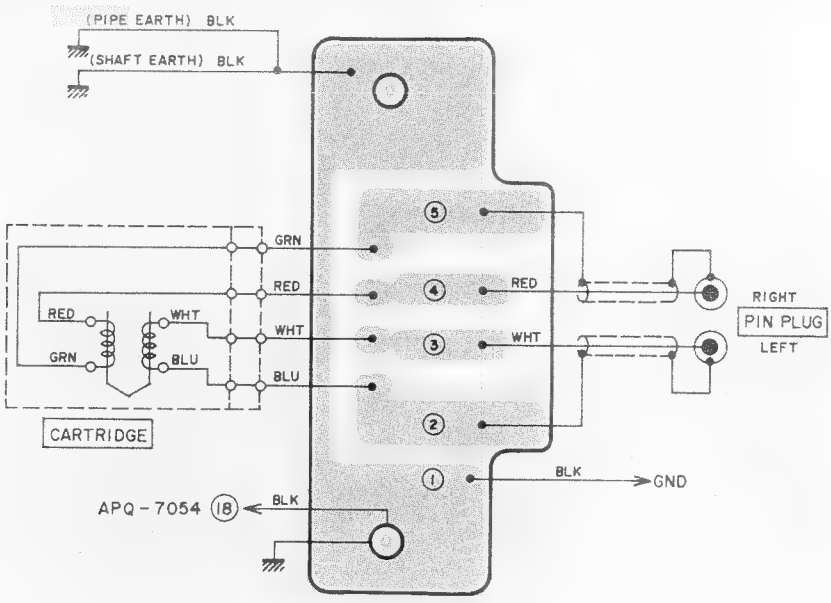

## 6) TOUCH SWITCH P.C BOARD (A) APQ-7050 and TOUCH SWITCH P.C BOARD (B) APQ-7051



## 7) LED P.C BOARD APQ-7052




## 8) INTER MEDIATE P.C BOARD APQ-7053



SECTION 2

# PARTS LIST

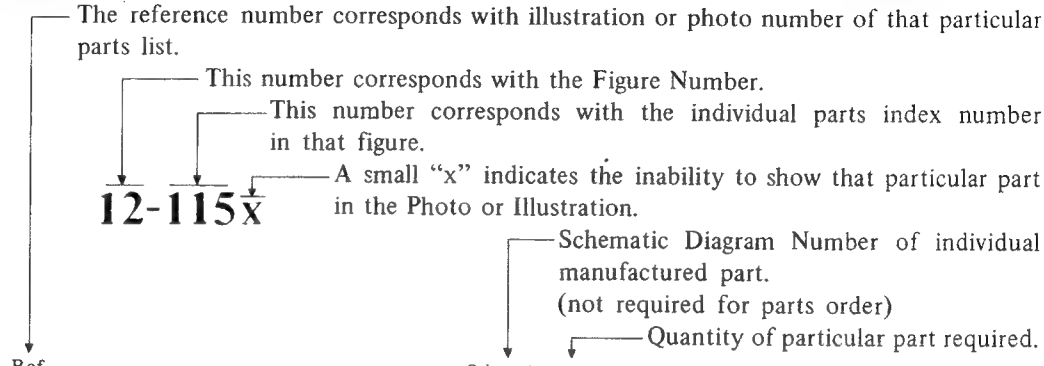
## TABLE OF CONTENTS



Resistor and Capacitor which is not listed in this parts list, please refer to COMMON LIST FOR SERVICE PARTS.

## HOW TO USE THIS PARTS LIST

1. This parts list is compiled by various individual blocks based on assembly process.
2. When ordering parts, please describe parts number, serial number, and model number in detail.
3. How to read List




| Ref. No. | Parts No. | Description | Schematic No. | Q'ty |
|---|---|---|---|---|
| | | **FLYWHEEL BLOCK #13** | | |
| 12-115x | 800425 | Flywheel Block Assy. Comp. | RDG -13 | 1 |
| 12-116 | 244506 | Flywheel Only | RD-233 | 1 |
| 12-117x | 244754 | Felt, Flywheel | RD-275 | 1 |
| 12-118 | 251324 | Main Metal Case | RD-236 | 1 |
| 12-119 | 253080 | Main Metal | RD-237 | 1 |

4. The symbol numbers shown on the P.C. Board list can be matched with the Composite Views of Components of the Schematic Diagram or Service Manual.
5. Please utilize separate "Common List for Service Parts" for Resistor Parts orders.
6. The shape of the parts and parts name, etc. can be confirmed by comparing them with the parts shown on the Electrical Parts Table of P.C. Board.
7. Both the kind of part and installation position can be determined by the Parts Number. To determine where a parts number is listed, utilize Parts Index at end of Parts List.
   It is necessary first of all to find the Parts Number. This can be accomplished by using the Reference Number listed at right of parts number in the Parts Index. (meaning of ref. no. outlined in Item 3 above).
8. Utilize separate "Price List for Parts" to determine unit price. The most simple method of finding parts Price is to utilize the reference number.

CAUTION:
1. When placing an order for parts, be sure to list the parts no. model no., and description. There are instances in which if any of this information is omitted, parts cannot be shipped or the wrong parts will be delivered.
2. Please be careful not to make a mistake in the parts no. If the parts no. is in error, a part different from the one ordered may be delivered.
3. Because parts number and parts unit supply in the Preliminary Service Manual (Basic Parts List) may be partially changed, please use this parts list for all future reference.

WARNING: ⚠ INDICATES SAFETY CRITICAL COMPONENTS. FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS.

AVERTISSEMENT: ⚠ IL INDIQU LES COMPOSANTS CRITIQUES DE SURETE. POUR MAINTENIR LE DEGRE DE SECURITE DE L'APPAREIL NE REMPLACER LES COMPOSANTS DONT LE FONCTIONNEMENT EST CRITIQUE POUR LA SECURITE QUE PAR DES PIECES RECOMMANDEES PAR LE FABRICANT.

## AC INLET SYSTEM

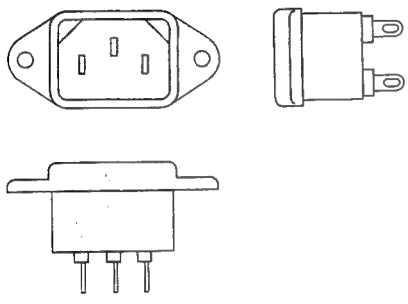
This model is equipped with an AC INLET SYSTEM. Please refer to the AC INLET SYSTEM CHART below for the specific type. By the AC INLET SYSTEM, AC (mains) cord can be connected to and disconnected from the model because the model is provided with socket exclusively for AC (mains) cord on its main body.
Please note, however, that certain models are not equipped with this system and has a built-in AC (mains) cord as before.

## AC INLET SYSTEM CHART

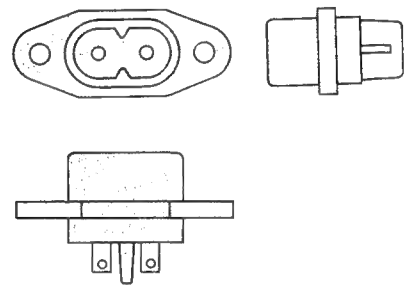
**CLASS I**

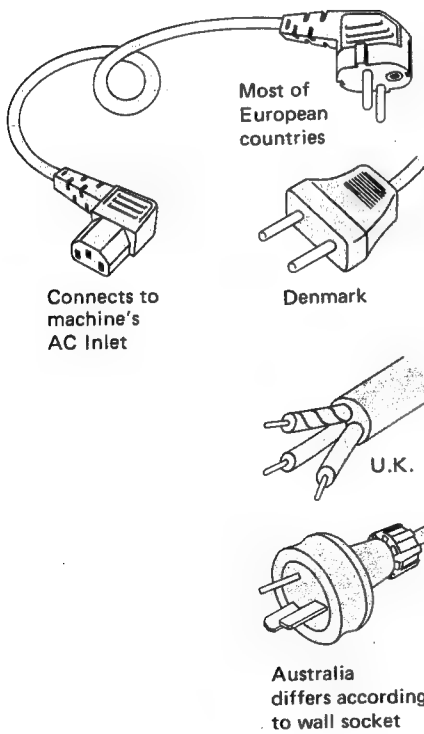
**CLASS II**

▣ This mark indicating double insulation will be attached to machine's rear panel

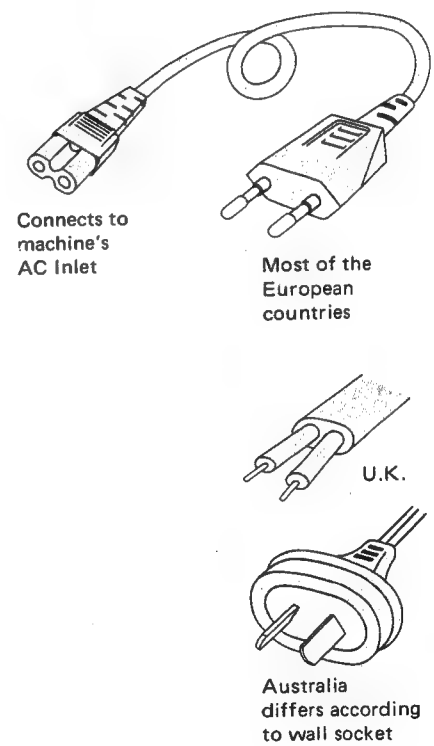


Picture 1
AC INLET to be installed on machines






Picture 2
AC (mains) cord




**Parts List for AC (mains) Cord Set**

| Standard | | Description | Type of AC Inlet | Parts No. |
|---|---|---|---|---|
| Class I | CEE | Cord Set CEE (3 cores) | 3P | EW302993 |
| | BEAB | Cord Set BEAB (3 cores) | 3P | EW302994 |
| | SAA | Cord Set SAA (3 cores) | 3P | EW302996 |
| | U/T | Cord Set U/T (3 cores) | 3P | EW302646 |
| Class II | CEE | Cord Set CEE (2 cores) | 2P | EW638144 |
| | BEAB | Cord Set BEAB (2 cores) | 2P | EW302995 |
| | SAA | Cord Set SAA (2 cores) | 2P | EW302991 |
| | U/T | Cord Set U/T (2 cores) | 2P | EW302899 |

## 1. RECOMMENDED SPARE PARTS LIST

Because, if the parts listed below are on hand, almost any repair can be accomplished, we suggest that you stock these Recommended Spare Parts Items.

| Parts No. | Description | Notes |
|---|---|---|
| BA326393 | Motor Drive P.C Board Comp. AP-Q70 (CEE) | CEE, UK, SAA |
| BA326392 | Motor Drive P.C Board Comp. AP-Q70 (CSA) | CSA, AAL |
| BA326391 | Motor Drive P.C Board Comp. AP-Q0 (U/T) | |
| BA326394 | Synthesizer P.C Board Comp. AP-Q70 | |
| BT326726 | ⚠ Power Trans. APT70-30 | CSA, AAL |
| BT326727 | ⚠ Power Trans. APT70-40 | U/T, CEE, UK, SAA |
| EC616342 | Trimmer/C. CTY122D33 15PF | |
| ED326748 | LED, 3 Segment SL-1174-03 | |
| ED326747 | LED, 1 Digit 7 Segment SL-1172-03 | |
| ED306724 | Silicon Diode S5277B | |
| ED321115 | Silicon Diode 1S1588 | |
| ED323211 | Zener Diode 05Z-13L | |
| ED324194 | Zener Diode 05Z-5.1L | |
| EF309390 | ⚠ Fuse 500mA 125V | CSA, AAL |
| EF309391 | ⚠ Fuse 800mA 125V | CSA, AAL |
| EF300585 | ⚠ Fuse (EAWK) 800mAT | U/T, CEE, UK, SAA |
| EF300590 | ⚠ Fuse (EAWK) 400mAT | U/T, CEE, UK, SAA |
| EF300591 | ⚠ Fuse (EAWK) 500mAT | U/T, CEE, UK, SAA |
| EI325557 | IC AP-400-A | |
| EI326750 | IC AP-500-A | |
| EI326702 | IC NJM78M05A | |
| EI322599 | IC TA75458S | |
| EI313797 | IC TC4001BP | |
| EI304657 | IC TC4011BP | |
| EI306726 | IC TC4069P | |
| EI325529 | Photo Interrupter EE-SH3-B | |
| EI325556 | Photo Sensor NJL5141E-A (A) (B) (C) | |
| EI326741 | Touch Sensor (1 mode) | |
| EI326742 | Touch Sensor (5 mode) | |
| EI324532 | X'TAL 5.4MHz | |
| EP320723 | Plunger Assy NX-9331H | |
| ES316432 | ⚠ Micro SW. K-2 SEMKO | |
| ES325484 | Leaf SW. MSW-0014 | |
| ES326720 | Micro SW. VV-S-01 | |
| ES326746 | Push SW. SUF12 | |
| ET325501 | Transistor 2SA1015 (O) (Y) | |
| ET306720 | Transistor 2SA966 (O) (Y) | |
| ET307234 | Transistor 2SC1815 (Y) (GR) | |
| ET325482 | Transistor 2SC1959 (Y) | |
| ET306719 | Transistor 2SC2236 (O) (Y) | |

| Parts No. | Description | Notes |
|---|---|---|
| EV315414 | Semi-Fixed/Vol. D8 Axial 20kB | |
| EV321652 | Semi-Fixed/Vol. V10K8-1-2 20kB | |
| EV326790 | Semi-Fixed/Vol. V10K8-1-2 300kB | |
| EV326982 | Semi-Fixed/Vol. V10K8-1-2 500kB | |
| EV326719 | Semi-Fixed/Vol. (Metal Film) TM8K (PH) 20kB | |
| EV326718 | Semi-Fixed/Vol. (Metal Film) TM8K (PH) 200kB | |
| EW306428 | ⚠ AC Cord (U/T) | |
| EW313884 | ⚠ AC Cord BASEC 2 Cores | UK |
| EW305691 | ⚠ AC Cord CUL | CSA, AAL |
| EW313882 | ⚠ AC Cord EC | CEE |
| EW313883 | ⚠ AC Cord SAA 2 Cores | |
| TP320719 | Main Gear Assy AP-D30 | |

## 2. SYNTHESIZER P.C BOARD (APQ-7049) BLOCK

| Symbol No. | Parts No. | Description | Schematic No. |
|---|---|---|---|
| 2-1 | BA326394 | Synthesizer P.C Board Comp. AP-Q70 | APQ-7089 |
| 2-IC1 | EI326750 | IC AP-500-A | 45-8-444 |
| 2-IC2 | EI325557 | IC AP-400-A | 45-8-435 |
| 2-IC3 | EI304657 | IC TC4011BP | 45-8-232 |
| 2-IC4 | EI313797 | IC TC4001BP | 45-8-348 |
| 2-IC5,6 | EI306726 | IC TC4069P | 45-8-263 |
| 2-TR1 | ET307234 | Transistor 2SC1815(Y)(GR) | 45-1-299 |
| 2-TR2 | ET325482 | Transistor 2SC1959(Y) | 45-1-385 |
| 2-TR3 | ET325501 | Transistor 2SA1015(O)(Y) | 45-1-328 |
| 2-TR4,5 | ET307234 | Transistor 2SC1815(Y)(GR) | 45-1-299 |
| 2-TR6,7 | ET325482 | Transistor 2SC1959(Y) | 45-1-385 |
| 2-TR8 | ET307234 | Transistor 2SC1815(Y)(GR) | 45-1-299 |
| 2-TR9to16 | ET325501 | Transistor 2SA1015(O)(Y) | 45-1-328 |
| 2-TR17to19 | ET325482 | Transistor 2SC1959(Y) | 45-1-385 |
| 2-TR20to22 | ET307234 | Transistor 2SC1815(Y)(GR) | 45-1-299 |
| 2-D1to9 | ED321115 | Silicon Diode 1S1588 | 45-3-62 |
| 2-D12 | ED321115 | Silicon Diode 1S1588 | 45-3-62 |
| 2-VC1 | EC616342 | Trimmer/C. CTY122D33 15PF | 24-2-32 |
| 2-VR1 | EV326982 | Semi-Fixed/Vol. V10K8-1-2 500kB | 36-10-255 |
| 2-VR2 | EV326718 | Semi-Fixed/Vol. (Metal Film) TM8K(PH) 200kB | 36-28-11 |
| 2-VR3 | EV326982 | Semi-Fixed/Vol. V10K8-1-2 500kB | 36-10-255 |
| 2-L1 | EO328137 | Peaking Coil 2.2μH (K) | 23-1-396 |
| 2-X1 | EI324532 | X'TAL 5.4MHz | 53-1-210 |
| 2-R2 | ER327710 | Carbon/R. F 1/4WS 150 ohms (J) | 35-11-30 |

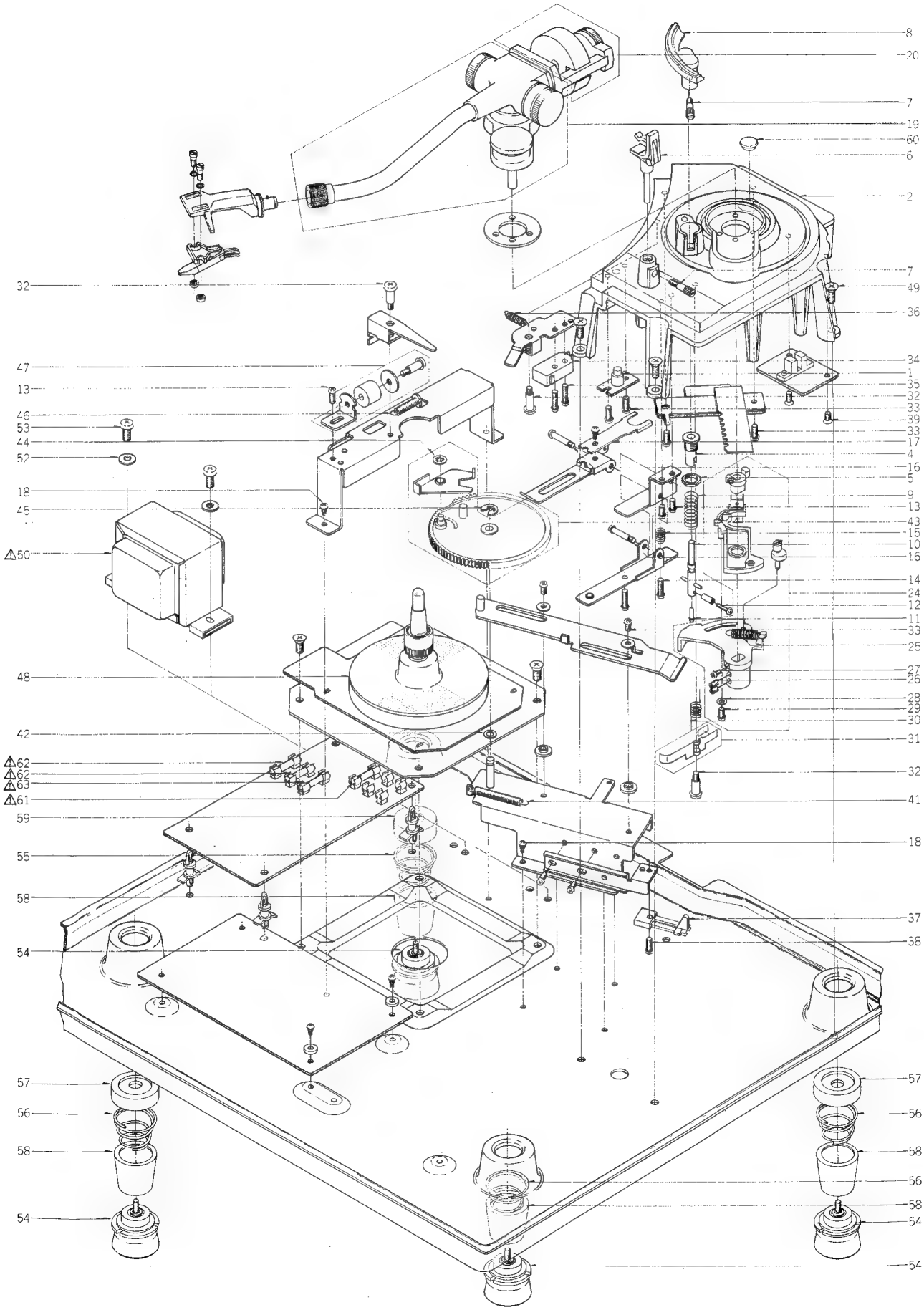
## 3. MOTOR DRIVE P.C BOARD (APQ-7054) BLOCK

| Symbol No. | Parts No. | Description | Schematic No. |
|---|---|---|---|
| 3-1 | BA326391 | Motor Drive P.C Board Comp. AP-Q70 (U/T) | APQ-7088 |
| 3-2 | BA326392 | Motor Drive P.C Board Comp. AP-Q70 (CSA) (CSA, AAL) | APQ-7088 |
| 3-3 | BA326393 | Motor Drive P.C Board Comp. AP-Q70 (CEE) (CEE, UK, SAA) | APQ-7088 |
| 3-IC1,2 | EI322599 | IC TA75458S | 45-8-415 |
| 3-IC3 | EI326702 | IC NJM78M05A | 45-8-496 |
| 3-TR1 | ET325501 | Transistor 2SA1015(O)(Y) | 45-1-328 |
| 3-TR6 | ET306719 | Transistor 2SC2236(O)(Y) | 45-1-307 |
| 3-TR7 | ET306720 | Transistor 2SA966(O)(Y) | 45-1-306 |
| 3-TR8 | ET306719 | Transistor 2SC2236(O)(Y) | 45-1-307 |
| 3-TR9 | ET306720 | Transistor 2SA966(O)(Y) | 45-1-306 |
| 3-TR10 | ET306719 | Transistor 2SC2236(O)(Y) | 45-1-307 |
| 3-TR11 | ET306720 | Transistor 2SA966(O)(Y) | 45-1-306 |
| 3-D4,5 | ED323211 | Zener Diode 05Z-13L | 45-6-76 |
| 3-D6to13 | ED306724 | Silicon Diode S5277B | 45-2-79 |
| 3-D14 | ED321115 | Silicon Diode 1S1588 | 45-3-62 |
| 3-D15 | ED324194 | Zener Diode 05Z-5.1L | 45-6-76 |
| 3-D16,17 | ED306724 | Silicon Diode S5277B | 45-2-79 |
| 3-VR1,2 | EV321652 | Semi-Fixed/Vol. V10K8-1-2 20kB | 36-10-255 |
| 3-VR3 | EV326790 | Semi-Fixed/Vol. V10K8-1-2 300kB | 36-10-255 |
| 3-VR4 | EV326719 | Semi-Fixed/Vol. (Metal Film) TM8K (PH) 20kB | 36-28-11 |
| 3-C1,2 | EC326788 | Solid Aluminum/C. 1.5μF(M) 16WV | 24-19-3 |
| 3-C12,13 | EC316188 | Elect./C. (Vert.) 1000μF 25WV | 24-12-49 |
| 3-C19 | EC302898 | ⚠ Metal Polyester/C. 0.047μF(K) 630WV(U/T) | 24-9-120 |
| 3-C19 | EC325485 | ⚠ MP/C. (Vert.) 0.047μF(M) 250WV (CEE, UK, SAA) | 24-9-134 |
| 3-C19 | EC314688 | ⚠ Ceramic/C. DE7150 FZ 0.01μF(P) 125WV (CSA, AAL) | 24-5-87 |
| 3-R35 | ER536984 | ⚠ Carbon/R. RD1/2 4.7 ohm(J) | 35-9-9 |

## 4. RETURN SENSOR P.C BOARD (APQ-3055) BLOCK

| Symbol No. | Parts No. | Description | Schematic No. |
|---|---|---|---|
| 4-D1,2 | ED321115 | Silicon Diode 1S1588 | 45-3-62 |
| 4-VR1 | EV315414 | Semi-Fixed/Vol. D8 Axial 20kB | 36-10-280 |
| 4-PH1 | EI325529 | Photo Interrupter EE-SH3-B | 45-18-6 |

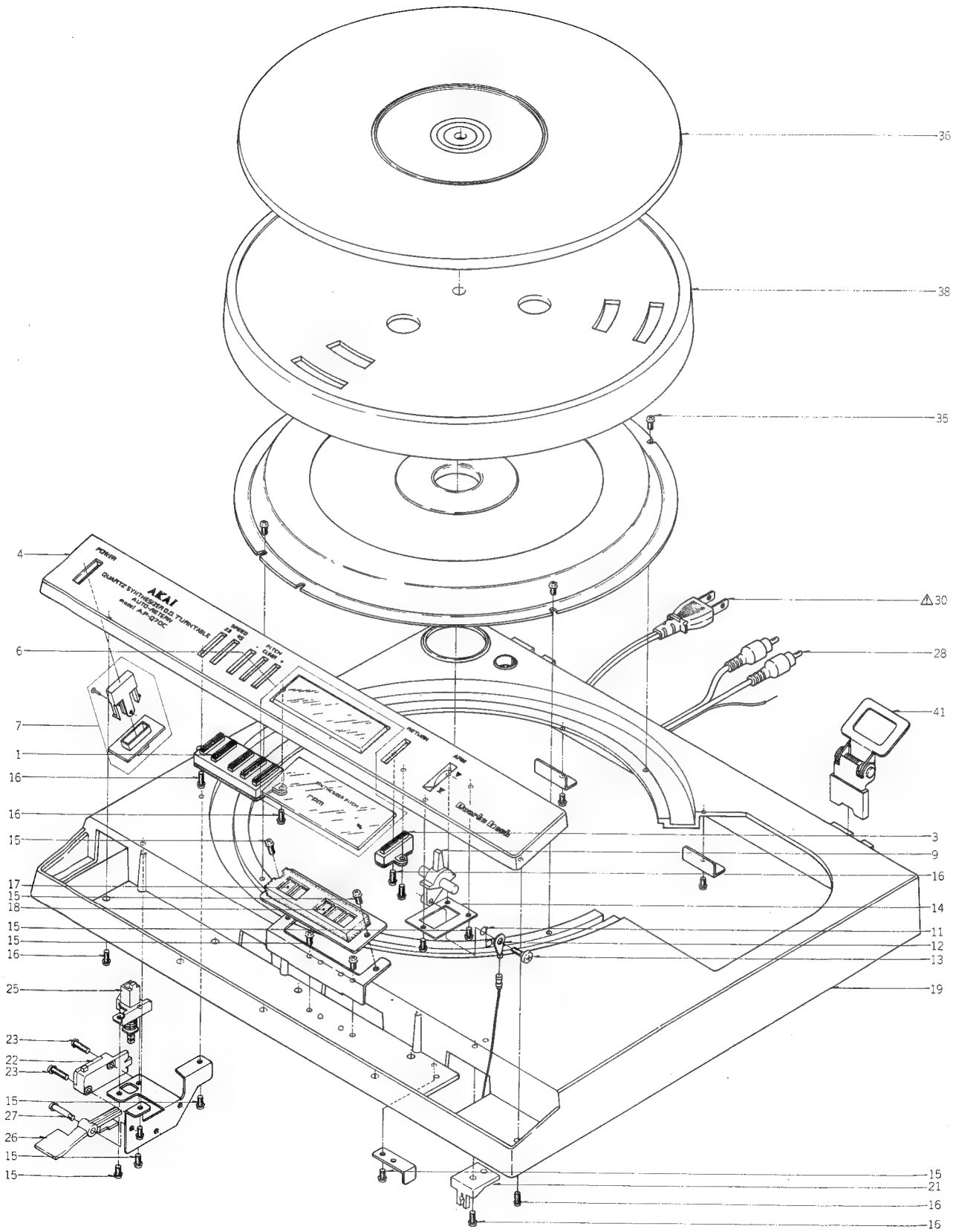
## 5. ASSEMBLY BLOCK (1)



## ASSEMBLY BLOCK (1)

| Ref. No. | Parts No. | Description | Schematic No. |
|---|---|---|---|
| | | **FG SENSOR P.C BOARD BLOCK** | |
| 5-1 | EI325556 | Photo Sensor NJL5141E-A(A)(B)(C) | 45-18-3 |
| | | **ARM BASE BLOCK** | |
| 5-2 | TP-326651 | Arm Base | APQ-7001 |
| 5-3x | TP326652 | Arm Base (BL) | APQ-7001 |
| 5-4 | TP326653 | Lifter Guide (A) | APQ-7002 |
| 5-5 | ZW326792 | Nut M8 D8×11×2t (P=0.75) | |
| 5-6 | TP326662 | Arm Rest Part | APQ-7010 |
| 5-7 | ZS326688 | Decoration Screw | APQ-7039 |
| 5-8 | TP326440 | Lifter Part AP-Q70 | APQ-7004 |
| 5-9 | ZG326689 | Lifter Spring | APQ-7040 |
| 5-10 | TP326655 | Lifter Shaft Part | APQ-7003 |
| 5-11 | TP326693 | Lifter Tip | APQ-7047 |
| 5-12 | ZS302510 | Screw, Pan 2×10 | |
| 5-13 | ZS326789 | S-Tight Screw, Pan 3×6 Black | |
| 5-14 | ZS419670 | Screw, Pan 3×12 | |
| 5-15 | ZG580533 | Clamp Spring | TD-2046 |
| 5-16 | ZS302767 | Shaft Screw | AP-0074 |
| 5-17 | ZG326660 | Lifter Plate Spring | APQ-7008 |
| 5-18 | ZS325495 | Tapping Screw, #2 BR 3×6 | |
| 5-19 | TP325969 | Tone Arm Part AP-Q70 | 53-1-191 |
| 5-20 | TP326736 | Weight | 53-1-199 |
| 5-21x | TP325970 | Tone Arm (BL) Part AP-Q70-BL | 53-1-195 |
| 5-22x | TP326737 | Weight (BL) | 53-1-200 |
| 5-23 | ZS325503 | Special Tapping Screw, Pan 3×12 | 7-1-70 |
| 5-24 | TP320718 | PU Plate Assy AP-Q70 | APD-3073 |
| 5-25 | ZG313071 | Coil Spring T1-6.3/0.5-22.4 | |
| 5-26 | ZS492917 | Set Screw, Hexagon Socket 3×5 (Cup/P.) | |
| 5-27 | ZS356837 | Screw, Pan 2×5 | |
| 5-28 | ZW452395 | Washer (SPC) D2.3×7×0.5t | |
| 5-29 | ZS669104 | Tapping Screw, #2 Pan 2.3×6 | |
| 5-30 | ZG325435 | Brake Lever Spring | APD-3038 |
| 5-31 | TP320748 | Brake Lever Assy AP-D30 | APD-3087 |
| 5-32 | MS302757 | Stopper Shaft | AP-0051 |
| 5-33 | ZS302945 | S-Tight Screw, Pan 3×8 (Black) | |
| 5-34 | ES326720 | Micro SW. VV-S-01 | 25-1-64 |
| 5-35 | ZS467796 | Screw, Pan 2.6×12 | |
| 5-36 | ZG313028 | Coil Spring T1-5.0/0.32-20.0 | |
| 5-37 | ES325484 | Leaf SW. MSW-0014 | 25-10-44 |
| 5-38 | ZS310337 | Screw, Pan 2×8 | |
| 5-39 | ZS200384 | Screw, Countersunk 3×6 | |
| | | **SUB CHASSIS (A) BLOCK** | |
| 5-40 | ZW556830 | Washer (SPC) D3.1×8×1t(Black) | |
| 5-41 | ZG313005 | Coil Spring T1-4.0-0.4-40.0 | |
| 5-42 | ZW259773 | Washer (Nylon) D4.1×7×0.5t | |
| 5-43 | TP320719 | Main Gear Assy AP-D30 | APD-3074 |
| 5-44 | ZW653163 | Retaining Ring CS Type 3 | 6-1-14 |
| 5-45 | ZW290283 | 'U' Ring 2.85M | 6-1-1 |
| | | **SUB CHASSIS (B) BLOCK** | |
| 5-46 | ZG326705 | Reject Spring | APQ-7057 |
| 5-47 | EP320723 | Plunger Assy NX-9331H | 44-1-130 |
| | | **ASSEMBLY BLOCK** | |
| 5-48 | BM326725 | Motor Block DDM-73C | 9-2-44 |
| 5-49 | ZS427026 | Screw, Countersunk 4×10 | |
| 5-50 | BT326727 | ⚠ Power Trans. APT70-40 (U/T, CEE, UK, SAA) | 38-4-803 |
| 5-51x | BT326726 | ⚠ Power Trans. APT70-30 (CEE, AAL) | 38-4-802 |
| 5-52 | ZW237857 | Washer (SPC) D4.1×10×1t | |
| 5-53 | ZS424056 | Screw, Pan 4×10 | |
| 5-54 | TP326723 | Insulator Part | 3-18-27 |
| 5-55 | ZG326683 | Float Spring (A) | APQ-7036 |
| 5-56 | ZG326684 | Float Spring (B) | APQ-7036 |
| 5-57 | TP326690 | Damper (A) | APQ-7044 |
| 5-58 | TP326691 | Damper (B) | APQ-7045 |
| 5-59 | TP326692 | Damper (C) | APQ-7046 |
| 5-60 | TP302504 | Rubber Bush | AP-0043 |
| 5-61 | EF300590 | ⚠ Fuse (EAWK) 400mAT (U/T, CEE, UK, SAA) | 39-1-60 |
| 5-62 | EF300585 | ⚠ Fuse (EAWK) 800mAT (U/T, CEE, UK, SAA) | 39-1-59 |
| 5-63 | EF300591 | ⚠ Fuse (EAWK) 500mAT (U/T, CEE, UK, SAA) | 39-1-60 |
| 5-64x | EF309390 | ⚠ Fuse 500mA 125V(CSA,AAL) | 39-1-65 |
| 5-65x | EF309391 | ⚠ Fuse 800mA 125V(CSA,AAL) | 39-1-65 |

## 6. ASSEMBLY BLOCK (2)



## ASSEMBLY BLOCK (2)

| Ref. No. | Parts No. | Description | Schematic No. |
|---|---|---|---|
| | **TOUCH SW. P.C BOARD (A) BLOCK** | | |
| 6-1 | EI326742 | Touch Sensor (5 mode) | 25-13-2 |
| 6-2x | ZS447840 | Tapping Screw, #2 BR 3×8 | |
| | **TOUCH SW. P.C BOARD (B) BLOCK** | | |
| 6-3 | EI326741 | Touch Sensor (1 mode) | 25-13-1 |
| | **OPERATION PANEL BLOCK** | | |
| 6-4 | SP326664 | Operation Panel AP-Q70 | APQ-7012,7013 |
| 6-5x | SP326665 | Operation Panel AP-Q70-BL | APQ-7012,7013 |
| 6-6 | TP326497 | Window Part AP-Q70 | APQ-7018 |
| 6-7 | SB326498 | Button Part AP-Q70 | APQ-7024 |
| 6-8x | SB326499 | Button (BL) Part AP-Q70-BL | APQ-7024 |
| 6-9 | ML326666 | Lifter Lever | APQ-7014 |
| 6-10x | ML326667 | Lifter Lever (BL) | APQ-7014 |
| 6-11 | ZG326682 | Click Spring | APQ-7035 |
| 6-12 | TP326721 | Release | 53-1-194 |
| 6-13 | ZG326694 | Lifter Screw | APQ-7048 |
| 6-14 | ML326668 | Lifter Lever Holder | APQ-7015 |
| 6-15 | ZS326789 | S-Tight Screw, Pan 3×6 (Black) | |
| 6-16 | ZS302945 | S-Tight Screw, Pan 3×8 (Black) | |
| | **LED P.C BOARD BLOCK** | | |
| 6-17 | ED326747 | LED, 1 Digit 7 Segment SL-1172-03 | 59-2-4 |
| 6-18 | ED326748 | LED, 3 Segment SL-1174-03 | 59-2-5 |
| | **CABINET BLOCK** | | |
| 6-19 | BC326744 | Cabinet AP-Q70 | 1-35-1 |
| 6-20x | BC326745 | Cabinet AP-Q70-BL | 1-35-2 |
| 6-21 | MZ326673 | Lifter Bracket (B) | APQ-7026 |
| 6-22 | ES316432 | ⚠ Micro SW. K-2 SEMKO | 25-1-59 |
| 6-23 | ZS419670 | Screw, Pan 3×12 (U/T, CSA, AAL) | |
| 6-24x | ZS302778 | Screw, Pan 3×15 (PC) (CEE, UK, SAA) | |
| 6-25 | ES326746 | Push SW. SUF12 | [illegible] |
| 6-26 | ML326677 | Power SW. Lever | APQ-7030 |
| 6-27 | ZS302767 | Shaft Screw | AP-0074 |
| | **RELAY P.C BOARD BLOCK** | | |
| 6-28 | EW326739 | Pin Plug Cord 2P (Except AAL) | 26-10-24 |
| 6-29x | EW326738 | Pin Plug Cord 2P UL (AAL) | 26-10-23 |
| | **ASSEMBLY BLOCK** | | |
| 6-30 | EW306428 | ⚠ AC Cord (U/T) | 26-3-64 |
| 6-31x | EW305691 | ⚠ AC Cord CUL (CSA, AAL) | 26-3-65 |
| 6-32x | EW313882 | ⚠ AC Cord EC (CEE) | 26-3-66 |
| 6-33x | EW313884 | ⚠ AC Cord BASEC 2 Cores (UK) | 26-3-67 |
| 6-34x | EW313883 | ⚠ AC Cord SAA 2 Cores | 26-3-69 |
| 6-35 | ZS306021 | S-Tight Screw, Pan 3×6 | |
| 6-36 | TP325443 | Table Sheet (Except AAL) | APD-3046 |
| 6-37x | TP323593 | Table Sheet (B) (AAL) | APD-3046 |
| 6-38 | TP326728 | Platter (B) | 1-34-8 |
| 6-39x | BC320744 | Dust Cover Part AP-D30 | 2-34-194 |
| 6-40x | SM325445 | Name Plate | APD-3048 |
| 6-41 | TP320745 | Hinge (D) Part AP-D30 | 9-4-9 |
| 6-42x | ZW273756 | Nut, #1 M3 (AAL) | |

⚠ Bei Schalterwechsel aus Sicherheitsgründen nur Schrauben des gleichen Materials verwenden!

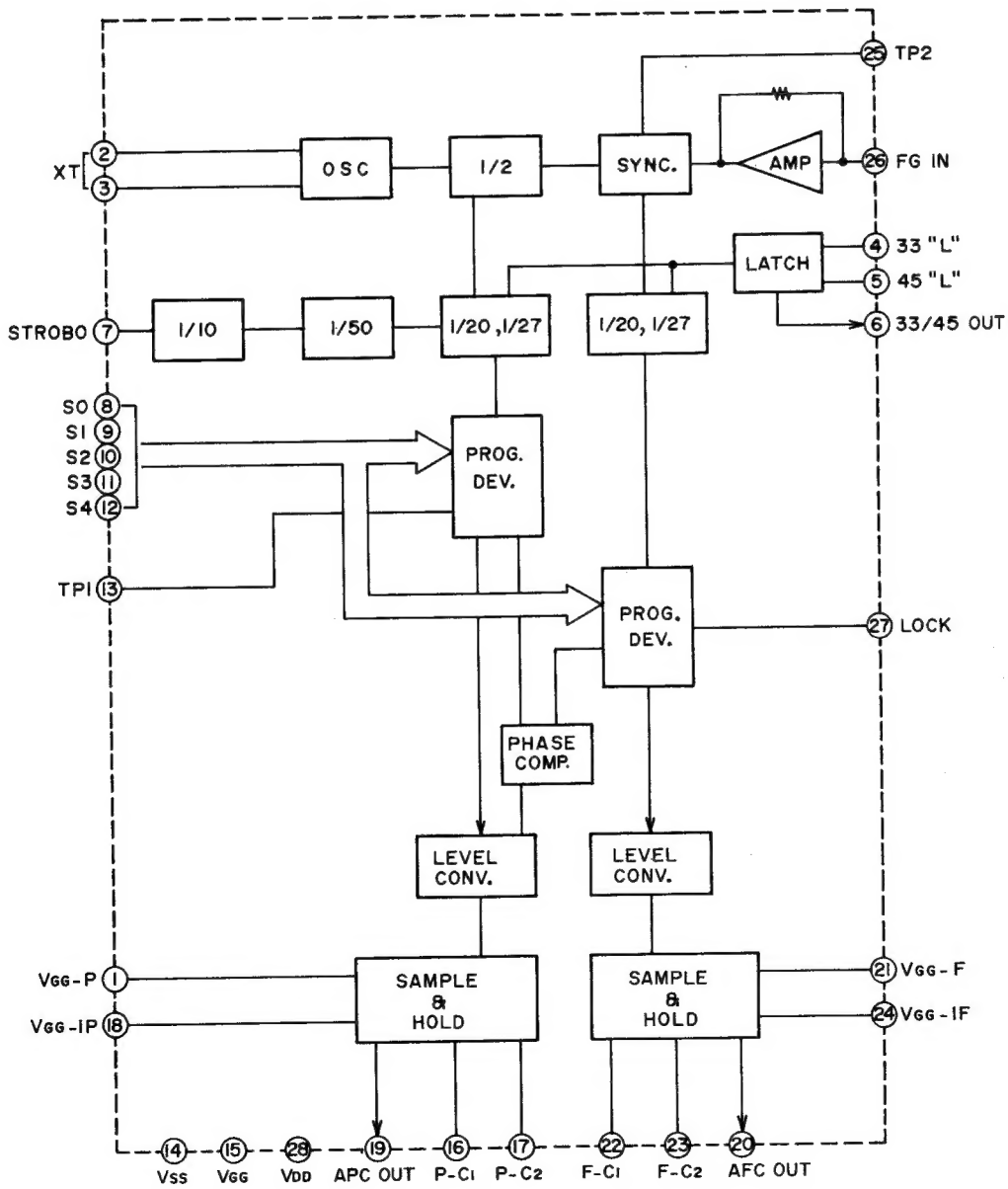
# INDEX

SECTION 3

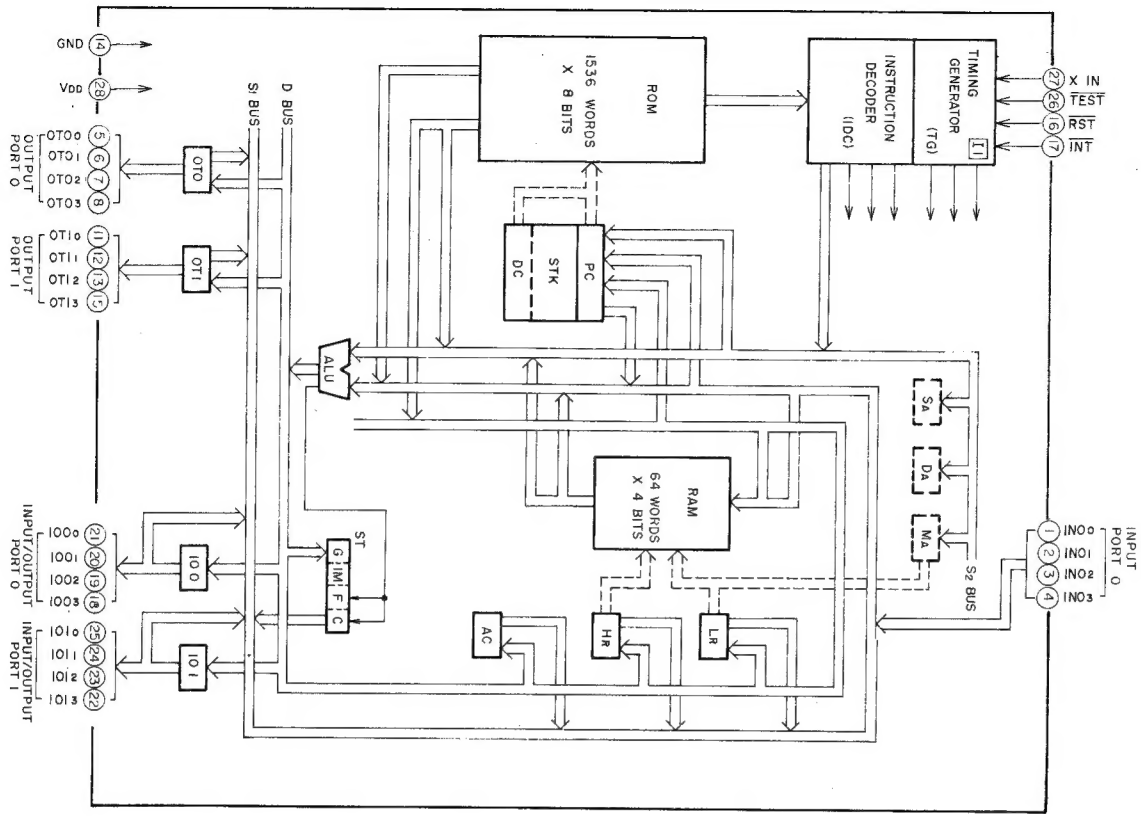
# SCHEMATIC DIAGRAM

1. SCHEMATIC DIAGRAM OF ICs
2. AP-Q70/C NO. 1601056A SCHEMATIC DIAGRAM

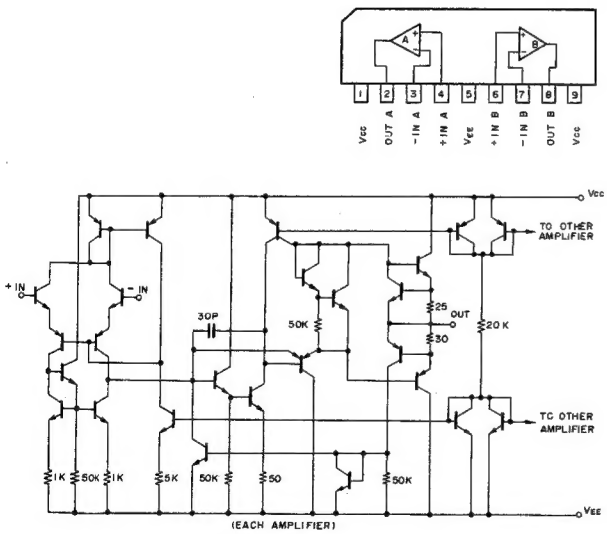
AP-400-A



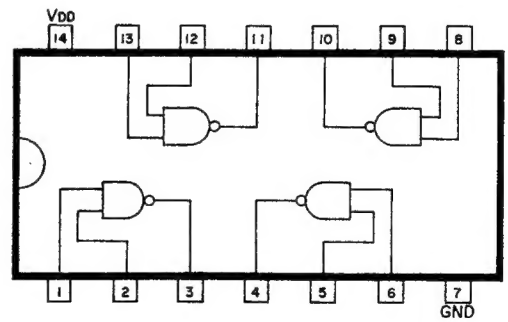
## AP-500-A



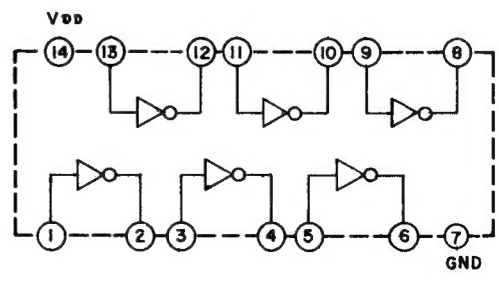

## TA75458S



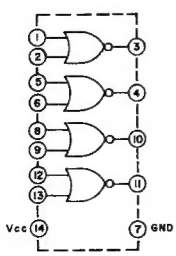

## TC4011BP




## TC4069P




## TC4001BP



AP-Q70/C

TOUCH SWITCH P.C BOARD(A) APQ-7050

TOUCH SWITCH P.C BOARD(B) APQ-7051

SYNTHESIZER P.C BOARD APQ-7049

FG SENSOR P.C BOARD APQ-5012

MOTOR DRIVE P.C BOARD APQ-7054

LED P.C BOARD APQ-7052

INTERMEDIATE P.C BOARD AQP-7053

RETURN SENSOR P.C BOARD APD-3055

POWER

U/T, CEE
UK, SAA

| | F1 | F2 | F3 |
|---|---|---|---|
| U/T 110/220V | | T400mA | |
| U/T 220/240V | | T400mA | |
| CEE | | T400mA | |
| UK, SAA | T600mA | | |

25A1015
25C1815
25C1959

25A966
25C2236

CSA
AAL

WARNING: △INDICATES SAFETY CRITICAL COMPONENTS. FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS.
AVERTISSEMENT: △ IL INDIQU LES COMPOSANTS CRITIQUES DE SÛRETÉ. POUR MAINTENIR LE DEGRÉ DE SÉCURITÉ DE L'APPAREIL NE REMPLACER LES COMPOSANTS DONT LE FONCTIONNEMENT EST CRITIQUE POUR LA SÉCURITÉ QUE PAR DES PIÈCES RECOMMANDÉES PAR LE FABRICANT

NOTE
UNLESS OTHERWISE SPECIFIED
RESISTORS IN OHMS 1/4W(J)
CAPACITORS IN μF 50WV(Z)
(FS) = FAIL SAFE RESISTORS
POWER TRANSFORMER IS DIFFERENT ACCORDING TO AREA

# AP-Q70/C
# SCHEMATIC DIAGRAM
NO. 1601056A
2C

0011050